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STATE OF NEW YORK

SEVENTH ANNUAL REPORT

OF THE

COMMISSIONERS

OF THE

STATE RESERVATION AT SARATOGA SPRINGS

1916

12-19-54

TRANSMITTED TO THE LEGISLATURE JANUARY 18, 1916

ALBANY
J. B. LYON COMPANY, PRINTERS
1916

RADIUM IN SARATOGA WATERS BENEFICIAL

Dr. Moriarta Ascribes Peculiarly Satisfactory Therapeutic Results to Its Presence Writes of Radium Treatment in Medical Journal.

That a Saratoga Springs physician is using radium largely in his practice is revealed by an article in the Medical written by Dr. Douglass C. Moriarta, on the subject of this expensive method of treatment. The paper was previously delivered by Dr. Moriarta before the Glens Falls Medical Society, last December.

Some idea of the expense involved in securing the radium necessary for such treatment may be gained from the statement that radium has a value of $120,000 a gram. The investment necessary in order to secure satisfactory results is from $10,000 to $25,000.

Dr. Moriarta, in the paper, is enthusiastic in the praise of the radium treatment into which he goes with considerable detail, giving the results obtained by himself in various cases. Of particuiar interest to Saratogians is the announcement of his belief that the peculiar therapeutic properties of the springs of Saratoga are largely due to the presence of radium.

Dr. Moriarta, writing of this says:

"I first became interested in radium in 1912 when the National Bureau of Mines announced that some of our mineral springs at Saratoga contained radium in solution, and that others were activated by radium emanations. The Bureau of Mines, in making this announcement, furnished me with the explanation of the value of our mineral spring waters which to me had always been unexplainable. In a paper written in 1908 I stated that the results I had observed from the use of the waters were surprising and could not, to my mind, be accounted for by a knowledge of the chemical analysis of the waters.

I stated that the natural waters of Saratoga presented unusual therapeutic properties which are peculiar to themselves and not presented by artificial waters made after the analyses of the chemists, and gave as a reason that I believed the combination of bases of acid radicals in nature's laboratory under pressure and heat did not result in the theoretical formula believed and accepted by the chemists who made the analyses. I am now convinced these peculiar, therapeutic properties are due to radium influences. We are not in a position to announce at this time any data relating to the limitations and efficiency of radium as a catalyzer. Suffice it to say that it is a property of marvelous importance.

"For years I have had unusual results from our mineral spring waters, when their use was associated with a carefully directed personal regimen, in cases of high blood pressure, gout, obscure neuralgic pain, arthritis, etc., the reasons for which were not clear to my mind, until I became familiar with the physiological action of radium in various amounts and knew that it was contained in our waters.

"With those who would refer all the benefit derived by these patients to the regulated regimen, and a protein-free diet, I would disagree. Radium, even in such small doses as occur in our Saratoga waters, is a wonderful synergist to metabolism and when it is administered, proteins do not have to be so restricted, neither do nitrates have to be used to control the high blood pressure of arterio-sclerosis."

Indian Family Drinking from the High Rock Spring at the Cone of Tufa Which Stands To-day on the Original Site in High Rock Park.

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STATE OF NEW YORK

No. 18

IN SENATE

JANUARY 18, 1916

REPORT OF COMMISSIONERS

To the Legislature of the State of New York:

The Board of Commissioners of the State Reservation at Saratoga Springs, pursuant to the provisions of Section 5 of Chapter 569 of the Laws of the State of New York passed in the year 1909, makes the following report as to the general situation and state of the said reservation, the proceedings of the Board and its receipts and expenditures.

The Reservation owns, roughly speaking, 400 acres of land; 140 mineral springs, from which there flows daily 100,000 gallons which, if used, would result in an income to the State of at least $730,000 a year and a profit of nearly $550,000; maintains in operation three bath houses; has laid out parks, walks and driveways for protecting, beautifying and making easily accessible the springs and baths; has carried on business at a profit during the past year and, if provided with facilities, equipment and sufficient funds to approximately use to advantage the reclaimed waters, will make a great deal more money next year.

APPOINTMENT OF PRESENT COMMISSIONERS

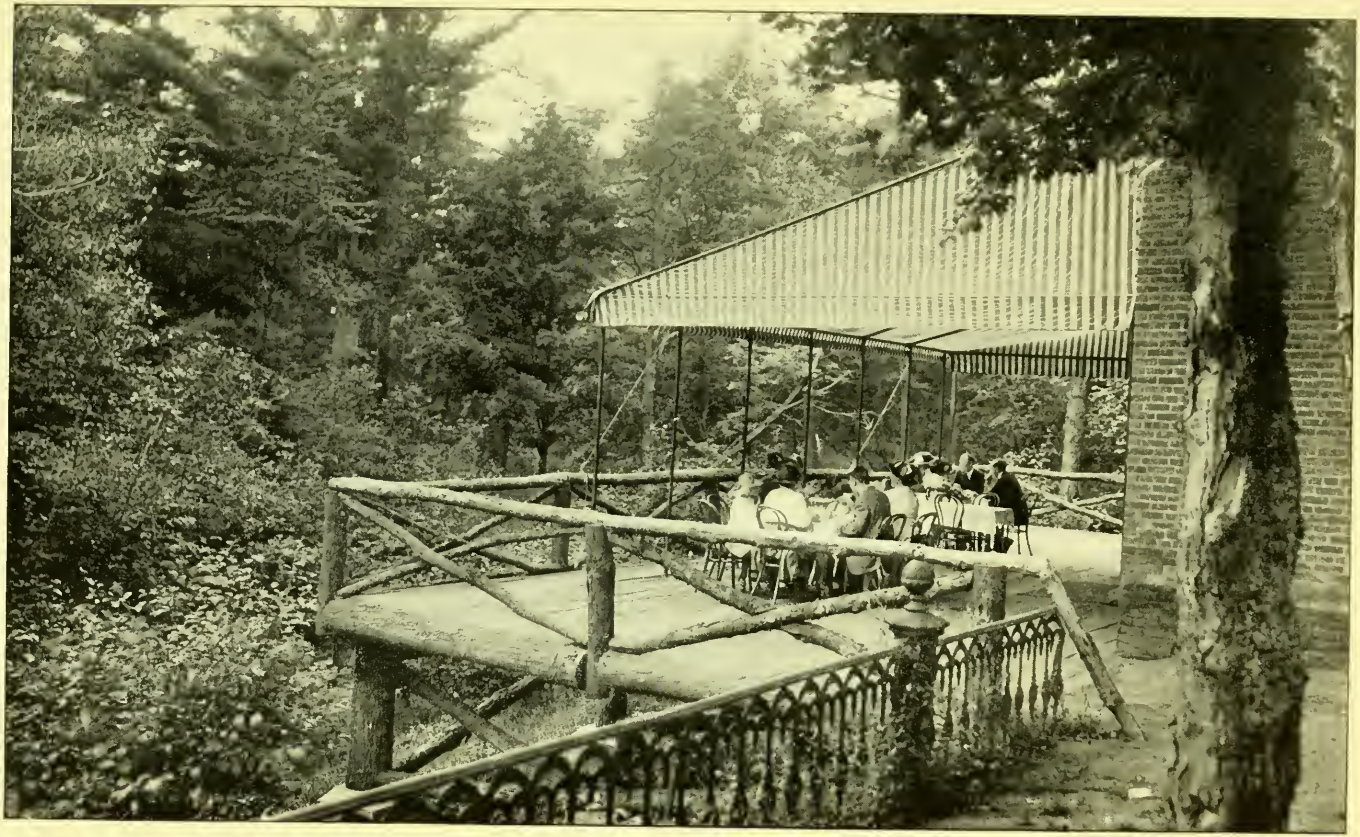
On the 10th day of May, 1915, the Governor appointed the undersigned, Frederick W. Cameron, George C. VanTuyl, Jr., and Frank N. Godfrey, Commissioners, in the place of George Foster Peabody, Frank N. Godfrey and Benjamin F. Tracy, whose terms of office had previously expired; and the newly appointed Commissioners, having duly made and filed their oaths of office, met on the 15th day of May and organized by the election of Frederick W. Cameron as Chairman of the Board and by the reappointment and employment of the supervising director, secretary, counsel, consulting engineer and chemist.

ACHIEVEMENT OF FORMER COMMISSIONERS

The incoming Commissioners found that the primary purpose for which the Reservation was established, that of preserving the natural mineral springs of Saratoga and restoring them to their former natural condition, had been substantially achieved by their predecessors in office. They found that the depletion of these natural springs by the pumping of mineral waters from artesian wells, for the purpose of securing the natural carbonic gas which the waters contained, had been halted and that the process of restoration had been progressing during a period of about three years; that springs which had not been flowing for a number of years prior to that period had begun to flow again and that the mineral waters which, when the springs first resumed their flow, were much below the normal, were becoming stronger and gradually approximating the condition in which they were before the process of depletion began; they found that the progress of the recovery of the mineral springs had been carefully observed and very complete records had been preserved, and that there was no reasonable ground to apprehend that such progress would not continue until the mineral water system reached once more its former condition of integrity.

AREA AND SUBDIVISION OF THE RESERVATION

The new Commissioners also found that their predecessors, in order to accomplish the purposes for which they were appointed,



A "Woodland" Breakfast in Picturesque Geyser Park for Early Morning Visitors to the Cathartic Springs.

had acquired, either by appropriation under the right of eminent domain or by purchase from the owners, sixty-six separate parcels or interests in lands, and that the total area of the lands so acquired amounted to about four hundred acres, divided into four different areas or parks, as follows:

High Rock Park (including Red Spring)	3.573 acres
Congress Park	3.081 "
Lincoln Park	65.100 "
Geyser Park	321.171 "

and that, in addition to the lands so acquired, they had taken the mineral water rights in other lands, having an area of 72.283 acres. They had also been able, notwithstanding the slender means at their disposal, to make very substantial improvements to the properties they had taken, all of which were wisely directed toward the accomplishment of the general purposes of the Reservation — for the improvement and better protection of the springs; for providing facilities for using the waters for drinking and bathing; for the purpose of improving the methods of bottling the waters and increasing the business of bottling and selling the same; and for the purpose of conserving and marketing the surplus carbonic acid gas from the various springs and wells which would otherwise pass off into the atmosphere and be wasted; and also, incidentally, for the purpose of laying out the properties they had acquired into park systems, making them accessible to the public by building roads through them and developing their beautiful and unusual natural features and protecting the fine forest growth which covered a considerable part of their area.

Plans for Future Development

The new Commissioners also found that their predecessors had conceived a carefully devised scheme for the further development of the Reservation into a unified whole and had formulated a coherent plan of improvement, intended to promote the utilization of the great mineral water resources, only an insignificant fraction of which had been hitherto utilized, and to enable the State to realize the great commercial value which they possessed, and the people to obtain the benefit of their therapeutical efficacy.

This great progress toward the realization of the purposes for which the Reservation was established had been accomplished by the constant, faithful, wise and disinterested efforts of the Honorable George Foster Peabody, the Chairman of the former Board, Honorable Benjamin F. Tracy, and their associate, Honorable Frank N. Godfrey, who was reappointed by the Governor and forms a connecting link between the original and present administrations of the Reservation. The new commissioners found that their predecessors had given to the accomplishment of the task assigned to them a very large portion of their time, the first Chairman, Mr. Trask, being a resident of Saratoga Springs, and the second, Mr. Peabody, having purchased a residence in Saratoga to facilitate his constant supervision of the work and spending most of his time there, in an unselfish and patriotic effort to advance the public interest, and had given to the Saratoga Reservation the best fruits of their ripe judgment in the administration of public affairs; that they had studied the technical questions which were closely connected with the prosecution of their work with great intelligence and had acted in the light which they derived from a comprehensive knowledge of the development of similar resources in European countries, as well as within the United States; and that they had laid broad foundations upon which the State may now erect a superstructure which will be comparable with the great importance and value of the mineral water resources of the Saratoga basin.

WORK CONFRONTING NEW COMMISSIONERS

Upon the accession of the new Commissioners to office, they found all the energies of the Department directed toward hastening the completion of the Lincoln Baths and remodeling the Kayaderosseras Baths, to meet the demands of the summer season already at hand, which it was expected would be much greater than any before realized, owing to the European war and the inability of Americans to resort to the foreign spas where so many had been for years accustomed to go for treatment.

This well founded expectation had led the former Commissioners to undertake the conversion of the Lincoln Spring build-

Driving an Automobile by a Reservation Spring on the State Highway Requires a Steady Hand. Note the Number of Stop-overs.

Lincoln Bath House, Front Entrance.

ing, which had been a carbonic acid gas plant, into a bath house, and the acquisition of the Saratoga Baths property, an expensively constructed bathing establishment, containing an excellent installation for Turkish and Russian baths, but no adequate facilities for giving baths in carbonated mineral waters of the Nauheim type.

Though the former Commissioners had explained the importance of having these accommodations ready at the opening of the Saratoga summer season and the necessity for an early appropriation of funds to accomplish their purpose, the appropriation was not in fact made until the 19th of April, and, in spite of the most strenuous efforts to complete the work, it was impossible to open the Lincoln Baths before the 3rd of July, and the Saratoga Baths (now called the Kayaderosseras Baths) before the 10th day of August. The failure to have the baths ready before the summer season was far advanced was a grave disadvantage and prevented the State from properly improving a great opportunity. Even under the adverse conditions, the number of baths given during the summer of 1915 was fifty per cent. greater than the number given the previous year which was itself a record. The lateness of the appropriation entailed the further disadvantage of compelling all the work to be done in haste and, therefore, less economically and thoroughly than it might have been done if adequate time for its proper accomplishment had been given; and some minor matters, the very great importance of which was later developed, had to be omitted altogether.

Development Accomplished

These two bathing establishments enable saline effervescent baths of different kinds to be given at Saratoga of efficacy equal to that attained at any European resort.

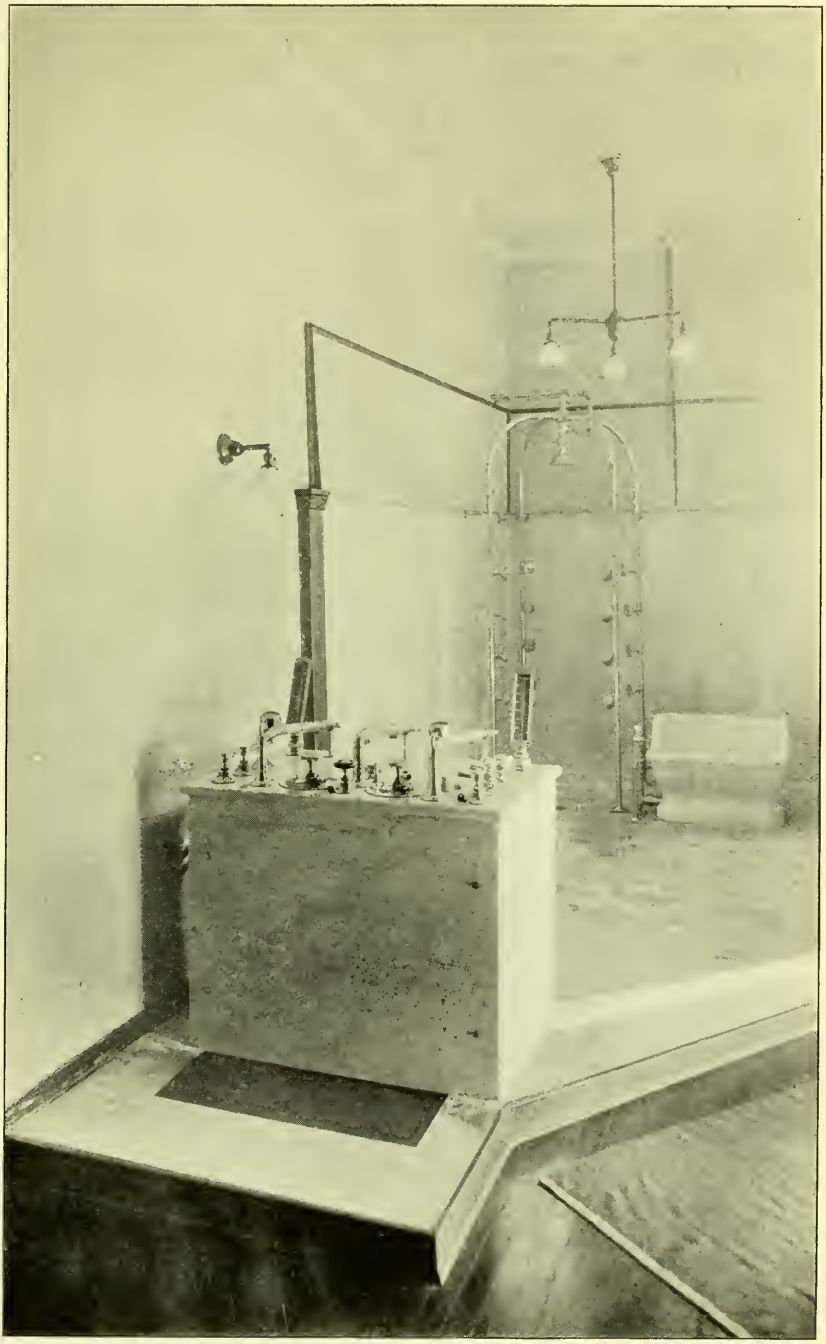
The Lincoln Baths is situated about a mile south of Congress Spring in the area known as Lincoln Park. The building is a simple wooden structure without any ornamentation and devoid of any attempt at architectural effect. The interior, however, is well arranged for the practical use to which it is now put, and all the appliances are of the best kind though without pretension to

luxury. Its equipment leaves nothing to be desired from a therapeutical standpoint. The mineral waters are stored under pressure in cylindrical containers in the manner described in the report of the Commissioners to the Legislature of 1915 (pp. 120, etc.) and delivered to the tubs with a high gas content, showing a supersaturation much greater than that usually attained at Nauheim and other foreign spas. The piping and fittings are all of copper or other noncorrosive metal, specially devised for this particular use, and the tubs are massive porcelain. The method of heating the water is the latest and best yet devised, especially designed to minimize the loss of gas due to the process, and its efficacy in this particular has been demonstrated by careful experiment. Every appliance has been provided to accomplish the most efficacious administration of all the mineral water treatments.

The water supplied to the Lincoln Baths is drawn from the Lincoln Spring and is adequately supplied with mineral salts and carbon dioxide; its saline content can be indefinitely increased by the addition of solutions of chloride of sodium and chloride of calcium, as is done at Nauheim.

The Kayaderosseras Baths are situated on Phila street, in the heart of the city, on the site of the old Putnam Spring and a few hundred feet from Hathorn Spring No. 1. The building was erected by Mr. H. M. Levengston at a very large expense. It is solidly and substantially built, faced with pressed brick and terra cotta and of pleasing design. Its interior was fitted up in the best manner then known for the purpose for which it was originally intended, with the exception of the administration of mineral water baths, which was a mere incident to its contemplated use. It was built at a time when the highly corrosive action of the mineral waters was not well understood; and all the piping and appliances of the mineral water system had been so impaired by the action of the waters as to render necessary their complete replacement by a new system, constructed of noncorrosive materials, which, like all work of this description carried on in a completed building, was attended with much delay and difficulty. After the old plumbing had been fully uncovered, it was found that even the drain pipes which carried off the fresh water as well as the mineral water were so corroded as to be unsafe and to make it necessary that they should also be renewed.

Main Lobby of Kayaderosseras Baths, Showing Elevator and Private Office.



Control Table, Rain Douche and Sitz Bath in Hydrotherapy Room at Kayaderosseras Baths.

Rest Room, Kayaderosseras Baths.

In the operation of this building it was found that the heat evolved from the pipes conveying the steam to the tubs for the purpose of heating the water was so great that in hot weather a more efficient system of ventilation was required for the comfort of patients, and such a system should be installed before another season. In other respects, the installation has given entire satisfaction in its operation.

The water supplied to the Kayaderosseras Baths is drawn from Hathorn Spring No. 1 and this supply was adequate for the business of last summer; but a substantial addition to the business, which will without doubt be realized during the season of 1916, will require a substantial addition to the water supply. This must be obtained from more copious sources than Hathorn Spring No. 1 and can only be secured by drawing upon some of the many copious wells or springs at the Geysers, the flow of several of which is fifteen or twenty times as great as that of the spring which now supplies these baths.

The development of the Soft, Sweet Spring, which was described in the last report of this Board, was accomplished in the manner proposed and its operation has been completely satisfactory. This water was furnished to the several bath houses of the State for the use of their patrons for drinking and was also extensively used throughout the city for domestic use during the summer season. As this bottling plant is some distance from the point where the shipment of the waters bottled at the Geysers Park will probably be made, the necessity for better access to it and the probable need of railway connections were so evident that the former Commissioners appropriated a right of way which will enable the Board in the future to put in a branch or siding on which railway cars may be moved, as well as to extend the Avenue of Pines to the new plant and afford facilities for laying pipe lines.

Further Acquisitions of Lands

The predecessors of the present Commissioners in their last report stated their intention to acquire several parcels of farm lands necessary properly to protect the water supply of important springs, aggregating some fifty acres in area; and this intention they carried into effect by the appropriation of nine different parcels, as follows:

First.—A tract of 2 acres of land belonging to Alfred B. Jenkins adjoining Geyser Park.

Second.—A tract of 19.75 acres belonging to the heirs of John A. Shonts, adjoining the Soft, Sweet Spring property.

Third.—A tract of 10.17 acres belonging to the heirs of Timothy Driscoll, adjoining the last mentioned parcel on the north.

Fourth.—A parcel consisting of 1.08 acres of land belonging to J. Lewis Turner and adjoining the last mentioned parcels.

Fifth.—A tract of 7.03 acres of land of Laura S. Ellsworth, containing two artesian wells producing mineral water.

Sixth.—A strip of land formerly belonging to the Chief Natural Mineral Water Company, consisting of 4.48 acres of land.

Seventh.—A parcel of land containing 1.66 acres belonging to Ida L. Just.

Eighth.—A parcel consisting of 1.94 acres of land belonging to the estate of Loring Freeman.

Ninth.— A small triangular parcel, consisting of 0.923 acres of land, belonging to Jesse Stiles.

The Commissioners also acquired a tract of 23.87 acres of land formerly belonging to Samuel O. Smith, for the purpose of experimental work to determine the direction of the flow of the mineral waters and other facts of fundamental importance in deciding upon proper measures for conserving and protecting the mineral water supply.

Immediately after the passage of the act appropriating funds for that purpose, the former Commissioners also accepted the option which they had previously secured upon the Saratoga Baths property, belonging to H. M. Levengston, and at once entered into possession and began the improvements that have been mentioned as necessary to adapt the establishment to the administration of medicinal baths; and shortly afterwards they purchased the property adjoining the Saratoga Baths on the corner of Phila and Putnam Streets over which existed only an inadequate right of way for access to the rear of the Saratoga Baths property and the whole of which is likely to be soon required to accommodate the increase of business at the Saratoga (now Kayaderosseras) Baths.

The Famous Congress Spring, Restored by the State of New York and Opened to the Public in June, 1915, upon Completion of the Handsome Sunken Garden Which Surrounds It.

Rehabilitation of Congress Spring

Many people whose memories went back to the early days of Saratoga, when she enjoyed the reputation of being the principal watering place in America, refused to have confidence in the expectation of her rehabilitation, or the measures taken by the State for the restoration of the mineral water supply, until they should see the old Congress Spring, the great foundation of Saratoga's reputation and prosperity, restored. The former Commissioners, therefore, believed it of great importance to the success of their undertaking that the restoration of this ancient fountain should be accomplished; and, at the time of their last report, they were engaged in drilling a well to intercept the sources of the spring at a depth of between 300 and 400 feet below the surface of the ground.

Further study of the hydraulics of the mineral water system led them to modify their plans for the new development and, instead of erecting a building over its site, to excavate a bowl about the spring or well, of sufficient depth to afford access to it at a point low enough to obtain a flow of water under the influence of the natural hydraulic head or pressure of the spring itself, without resorting to pumps or any artificial means of raising the water. This has been most successfully accomplished. The bowl has been carefully protected from an influx of the local fresh ground waters, and careful provision has been made for carrying off the precipitation within its circumference, as particularly described in the report of the consulting engineer, with the result that never before in the history of the spring has it been possible to obtain access to its waters so easily and satisfactorily as today.

For many years prior to the establishment of the Reservation, this spring flowed below the floor of the building which enclosed it, and its waters had to be brought up upon a lift. Prior to that, its site was covered by a small building of Grecian design, which stood at a much lower level, and from a small depressed area about the tube of the springs, boys with long-handled dippers were able to reach the waters and dip them up for service to the public; but, under neither of these conditions was it possible for visitors to the spring to see the waters in the spring from any point of observation to which they were admitted.

Under the present arrangement, however, the public can descend to the point where the waters of the spring naturally flow and see them entering, under the influence of their natural head, into the open basin from which they are dipped and served to those who wish to drink them. This new and ideal arrangement has many advantages beside arousing the interest and gratifying the curiosity of visitors. The best devised mechanical contrivances sometimes fail to operate in accordance with the intention of those who install them, but the forces of nature are always to be relied upon and do not have to be kept up to their work by the hand of man.

Erection of Trolley Station

The Commissioners, in their last report to the Legislature stated that they had acquired the property adjoining the Favorite Spring on Broadway and adjacent to the Hudson Valley terminal, which was necessary for the proper development of the park and terminal to be constructed and maintained by that company under a lease of the land for that purpose. During the past year a trolley terminal station has been erected upon the property, in accordance with plans and specifications prepared by Ludlow and Peabody, architects, of New York City and approved by the Commissioners; and plans have been perfected for laying out the contiguous land so as to harmonize with the park system on the opposite side of Broadway. This new building is beautiful in design, convenient for the operation of the trolley system, and so constructed as greatly to promote the comfort of passengers and to make access to Saratoga more convenient and agreeable. The shabby old structures that occupied its place have been removed, and the surroundings have been rendered much more beautiful and attractive than ever before. A reasonable income from the investment of the State in the land thus occupied has been assured for a long time to come, and the indirect advantage offered by the more convenient access to the springs and bath houses of the Reservation will, without doubt, prove a substantial source of increased patronage and consequent revenue to the State.

New Trolley Station of the Hudson Valley Railway, Opposite Congress Park, Erected in 1915.

Minor Improvements

The operation of the installation at the Congress Spring was so satisfactory that one similar in its fundamental idea, but without the same elaboration of detail, has been constructed at the Emperor Spring in the High Rock Park and has resulted in making the waters of the latter spring easily accessible to the great number of people who go there to obtain them.

In addition to the construction of the new Lincoln Baths, the former Commissioners also made some substantial improvements in the High Rock Baths, particularly in securing a more copious water supply and a mineral water adequately charged with carbonic acid gas, which enabled them to administer baths of undoubted efficacy throughout the summer of 1915, often to the full capacity of the bath house.

Concurrently with the prosecution of the work upon the bath houses, a fresh water supply was developed at Lincoln Park, as outlined in the report of the consulting engineer annexed to the report of the Commissioners to the Legislature of 1915, which has proved well adapted to the necessities of the Lincoln and Kayaderosseras Baths and has made the swimming pools at those establishments perhaps the most popular feature of the entire system. The demand for this water has been so great, however, as to call for an increased capacity, which can easily be secured at a small expenditure.

The rearrangement of the Hathorn drinking pavilion, described in the last report of the consulting engineer, was completed before the beginning of the summer season of 1915 and accomplished all that was expected of it in the way of increasing the capacity for affording an adequate supply of the different potable waters of the Reservation to all who wished to drink them. The public response to this new provision of the Commissioners was immediate and remarkable, the number of paid admissions during the season being about double those of the corresponding period of 1914. As many as 1,800 persons availed themselves of the facilities thus afforded for drinking the various waters in a single morning and paid an admission fee of five cents each, in addition to the hundreds of people who, at the same time, patronized the free public service at the same pavilion and at different springs through the reservation.

The many improvements to which reference has thus briefly been made and which the present Commissioners found in progress at the time of their appointment taxed their utmost efforts to bring to completion and left them no time until after their completion for the consideration of further steps toward the full development of the mineral water supply.

Bathing Business

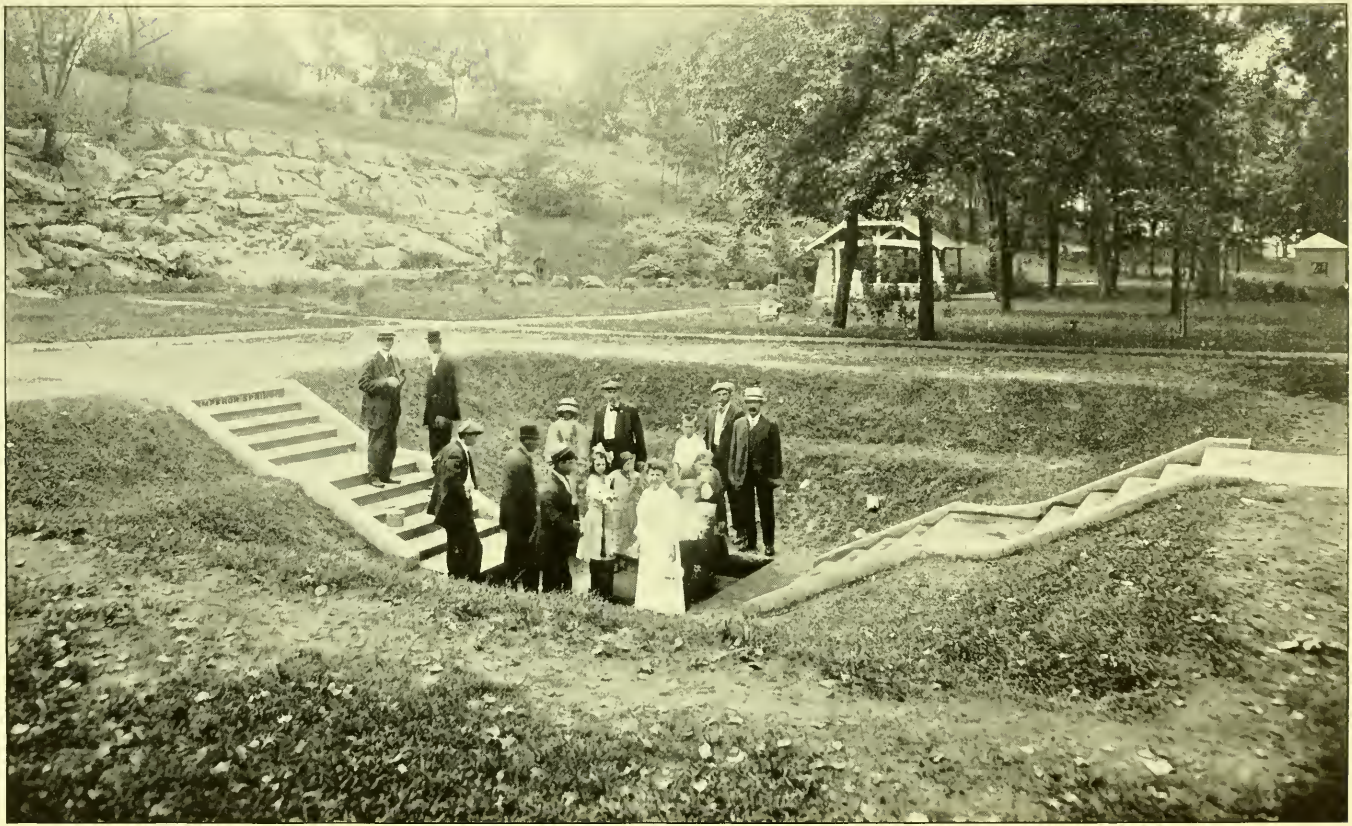
In the year 1913, the only bath house belonging to the State was a small structure known as the Magnetic Baths, situated at High Rock Park. It was illy equipped with obsolete plumbing, cheap and well-worn tubs, the mineral water supply for which was delivered to them by such primitive and ineffective appliances as deprived it of most of its gas content before it reached the tubs.

The Saratoga Baths, then belonging to Mr. Levengston and since acquired by the State, were managed by a lessee, with whom the Commissioners, in order to encourage the use of the mineral waters for baths, made an agreement to furnish waters from the Hathorn Spring No. 1 for bathing purposes for the nominal sum of $100 for the season. From the best information which the Commissioners were able to obtain, the total number of baths and special treatments given in these establishments during the season of 1913 was 7,154.

The following year, some inexpensive improvements were made to the Magnetic Baths, having relation principally to the mineral water supply, and the Saratoga Baths property was again rented by Mr. Levengston to a tenant with whom an arrangement was made for a mineral water supply similar to that of the preceding year. During the season of 1914, the number of baths and special treatments administered was 7,843.

In 1915, a further improvement in the water supply of the Magnetic Baths was effected, which resulted in the delivery to that house of waters that satisfied therapeutic requirements. In the same year, the Saratoga Baths property was acquired by the State, the improvements which have been described were made to it, and it was opened for business on the 10th day of August under the name of "Kayaderosseras Baths." The Lincoln Baths were completed, as has been mentioned, and opened on the 3d

Entrance to Soft Sweet Spring Bottling Plant. The Arms of the State of New York on Bottled Waters Indicate State Ownership of the Sources.



Emperor Spring in Historic High Rock Park, Showing Newly Constructed Bowl, and Famous Rock Scarp in Background.

day of July. The aggregate number of baths and special treatments given in all these establishments during the year was 11,292.

During the season of 1915, all the bath houses were operated by the State until the 15th day of August, when it was found that the balance of funds appropriated and applicable to the purpose was inadequate to continue the operation of the bath houses until the time arrived when it was deemed proper to close them for the season; and the High Rock and Kayaderosseras Baths were leased to Oscar R. Stenstrom, who had been employed as superintendent of the Kayaderosseras Baths under a previous contract.

Upon a careful study of the situation, there seems no reason to doubt that, if the appropriation made by the Legislature to enable the Commissioners to acquire and refit the Saratoga Baths property and to convert the Lincoln Spring building into the Lincoln Baths had been available two months earlier, so that all the bath houses of the State could have been opened in the month of June, a very much greater income would have been realized and a much more rapid development of the bathing business would now be apparent.

The total cash receipts at the bath houses turned into the state treasury were $8,278.13, and a net profit over the cost of operation amounting to $2,006.47 was shown.

Business of the Bottling Department and Drinking Pavilion

The business of operating the Hathorn Spring drinking pavilion and the bottling and sale of the waters of the Reservation has been, since the property was acquired by the Commissioners for the State, in the hands of Mr. Frank H. Hathorn and those who have succeeded him under a lease terminable upon ninety days' notice. Mr. Hathorn was the only person at that time who had an organization adequate to the handling of this business and the courage to undertake it under the conditions which it was found necessary for the Commissioners to impose. He was in touch with the customers for the cathartic waters which had survived the practical extinction of the springs and seemed to the Commissioners more likely than anyone else to be able to

hold the remnants of the former business and to lay the foundations and promote the development of a great future business so as to keep pace with the gradual restoration of the springs.

The business at first was unprofitable, but steadily improved. In 1915 a net profit of $8,742.69 was realized by the lessee. For the year 1915 the State obtained a rental of $4,495.61.

GAS BUSINESS

Not long after the properties of the gas companies were acquired by the State and the drastic pumping of mineral waters was stopped and the mineral water head began to increase and the condition of the wells and springs to improve, many wells in the Coesa valley began to flow again under the influence of the natural hydraulic pressure; and the amount of mineral waters discharged from them would have been sufficient, if their flow had not been checked, to have arrested the process of restoration and to have prevented the springs within the former limits of the village from ever having achieved a complete recovery. These wells, however, were tubed, and the flow of water from many of them was checked; but it was found that a large amount of mineral water and gas might be permitted to flow from them without sensibly affecting the springs and wells in other areas and that, in spite of all precautions, a large amount of carbonic acid gas was constantly escaping into the atmosphere and being dissipated. Under such circumstances, it seemed the part of wisdom to conserve this supply, which would otherwise be wasted; and an arrangement was accordingly made with the General Carbonic Company to compress and market the surplus gas. It is estimated that this product is likely to amount to as much as a ton each day, which, at one cent per pound, the price now paid, will produce a very substantial revenue; though, with the present facilities for collecting the gas and utilizing it, it is impossible to continue the business during the winter months when water is liable to congeal in the pipes and separators.

During the year 1915, the total revenue derived by the State from the Reservation amounted to $14,891.22.

Upon the expiration of the contract with Dr. Albert Warren

Ferris, on the first of October, the fund applicable to general superintendence of the Reservation having been depleted by the unexpected demands upon it for money to make the repairs and new installations required to adopt the Kayaderosseras Baths to their present use, Hon. Charles C. Lester accepted the position and responsibilities of Curator, without salary, and has since performed the duties of that office.

The rapid advance which has been made toward placing the Reservation upon the basis of an income-producer of great value to the State has led the Commissioners to an earnest consideration of the new steps that ought to be taken toward the further and complete development of the great natural resources confided to their administration. They have been embarrassed by the conditions incident to the inception of all business undertakings, which require at first an expenditure out of proportion to receipts, until the business has developed to a point where the income is sufficient to carry the expenses of operation. This point, however, has been reached in respect to each of the sources of revenue; and, with increased use of the waters, the percentage of profits to gross receipts will constantly increase. The limits within which development may be had are so wide as not to warrant their present consideration.

Development Demanded on a Large Scale

A conservative estimate of the quantity of mineral water that might be drawn from the mineral water system at Saratoga without causing its depletion or impairment will indicate a daily product of at least 100,000 gallons. If this should be fully utilized for baths, it would yield to the State a gross income of $2,000 daily, or $730,000 annually, at present prices. The cost of operation of the bath houses would not exceed 25 per cent. of this amount, and there would, therefore, be left an annual profit to the State of $547,500. If the water should be bottled and sold for drinking, it would produce an income at least ten times as great, or $7,300,000 annually. The expense of bottling and marketing the product ought not to exceed 50 per cent of the gross receipts.

Under proper management, the State would realize profits beyond the amounts derived from the sale of the waters, for their use for bathing would bring in its train a demand for baths of other kinds and many forms of treatment now given at European spas from which additional revenue might be realized; and the sale of the mineral waters in bottles would carry the sale of the Soft, Sweet Spring waters of the reservation, of which there is practically an inexhaustible supply, of a purity and softness excelling the best and purest now on the market. To attempt to figure on these possibilities leads to results of such great proportions as to challenge credulity.

If any doubt be entertained, however, as to the possibility of realizing great results on account of the lack of demand for so many baths and the use of such large quantities of water for drinking, the results at some of the European resorts should go far to remove them.

At Nauheim, which is situated in the same mineral water zone as Homburg and Wiesbaden, and is in competition with them, there are given more than 400,000 baths annually, and at the three resorts mentioned the annual aggregate exceeds the maximum estimate for Saratoga. The mineral waters of Saratoga are similar to those at Nauheim, but much better in quality.

As to the sale of bottled waters, if we consider the fact that Vichy has exported to foreign countries over 20,000,000 bottles in a year, besides the enormous quantity consumed in France, it does not seem unreasonable to believe that with proper development the entire estimated supply of Saratoga waters, amounting to 100,000 gallons per diem, might be utilized in the near future for bathing and drinking.

The waters from which this great profit might be realized by the State are now being permitted to run off into the adjacent water course and be wasted, for the want of proper appliances and facilities for their use. Hitherto, with the doubt whether the mineral water system, once depleted by the exploitation of the carbonic gas companies, would ever revive, hesitation to incur a large expenditure for this purpose might have been excusable. Hereafter, with the knowledge that the measures of conservation have proved effective and that the depletion is being made good

Early Morning Patrons at Drink Hall for "Before Breakfast" Cathartic Waters.

The Saratoga Soft Sweet Spring (in Foreground) is Surrounded by Many Acres of this Attractive Scenery. Note the Sanitary Fencing Around Spring and Adjoining Land.

and the system is returning to a normal and permanent condition, further delay to secure the advantages which this great and valuable natural resource offers and permitting it longer to run to waste will be properly deemed nothing but a foolish and inexcusable neglect, on the part of the State government, of the interests of the people.

Cost of Complete Development

For complete development, adequate for the proper protection and utilization of the entire water supply, accesssories in keeping with those at the principal European spas, modern and luxurious baths, an attractive and beautiful drink hall and an adequate park area for the exercise and amusement of those resorting to Saratoga for health, it is estimated that an expenditure of $2,500,000 should be made. Such an expenditure would secure a development worthy of this, the most important group of springs in the world.

It is not necessary, however, that this entire amount should be expended immediately. It would be much better to do the work with a reasonable degree of deliberation and careful attention to detail than precipitately and without due consideration.

In the three bath houses now owned by the State, there are installed about 100 tubs. If these were utilized to their full capacity, they might suffice to give six or eight hundred baths daily. To fully utilize the water supply, there should properly be installed at least as many as are now in use at Nauheim. This, however, is not presently necessary. The largest number of mineral water baths given in a single day during the past season was only 250, and three times that number might be given with the present installation. Therefore, although none of the present baths are as luxuriously appointed as the best of those abroad, the orderly development of the reservation will not require the commissioners to enter upon the work of increasing the bathing facilities for another year. Other things that are mentioned later can also wait.

Drink Hall an Immediate Necessity

A very important part of the proper development will be an adequate drink hall. Abroad, the drink halls are constructed

with great elaboration of detail and rendered attractive by the highest architectural art. Something of this kind is an immediate necessity at Saratoga. During the past summer as many as 1,800 people have come to the Hathorn pavilion to drink the waters in a single morning. This is double the patronage of the previous year. The present facilities are inadequate and must be increased before another season. This can be done at small cost to meet the demands of another year by increasing the facilities for heating waters, procuring additional chairs and tables and utilizing fully the remaining space in the Hathorn pavilion. A far more important increase will be required, however, for the season of 1917; and, by that time, the situation should be met, not by any temporary makeshift, but by an erection as adequate, dignified and beautiful as any that has been provided at the important resorts in Europe. The commissioners are prepared to recommend the site and details of such a structure.

A Bottling Plant Needed Now

The business of bottling and selling the Saratoga natural mineral waters, which once were exported to every civilized country, was practically extinct when the State entered upon the task of forming the Reservation. Since the condition of the waters began to improve, the business has increased; and, during the past summer, the demand grew so rapidly as to exhaust the stock on hand and make it impossible to fill all orders with the bottling appliances at hand. These consisted of the apparatus the State had taken with the different properties it had appropriated to form the Reservation, which was out of date and had been largely out of use for a series of years during which the springs had been in an exhausted condition, yielding no waters fit to bottle. With the present much greater and constantly increasing demand for bottled waters, a new, modern and wholly sanitary and economical plant should be at once installed for the construction of which the commissioners have selected a site and are also prepared to recommend the proper plans and specifications.

A Storage System for Mineral Waters

The supply of 100,000 gallons of mineral water is not required for bathing at a uniform rate throughout a 24-hour period, nor

throughout the entire year. It is required during a period of from four to six hours each day and principally in the summer time. The conditions in this respect are not unlike those at Bad Kissingen, Nauheim and Homburg in Germany, where similar waters are found. In the latter place the waters are stored in an underground cylindrical reservoir under a pressure of two atmospheres or 30 pounds to the square inch. Some such storage system is a fundamental necessity at Saratoga. It is rendered necessary for the further reason that the springs or wells that produce the mineral waters are quite distant from each other, being distributed along a line three or four miles in length. No greater installation for bathing is practicable, and it is doubtful if the present baths could be operated to their full capacity, without it. An adequate storage system should be installed at a central point where the water may be kept under pressure and delivered at the required place in good condition as needed for use.

Fresh Water Supply

In close connection with the last mentioned topic is the supply of fresh water for plain baths, Turkish baths, swimming pools, etc., now supplied by ground waters from Lincoln Park. A larger supply will be needed to meet the demands of another season and to adequately increase the capacity of the system will require no great expenditure.

Bathhouse for Colored People

Embarrassment has already been felt in affording an equal use of the bathing and other facilities to negroes. Many patrons strenuously object to using the same appliances and attendants generally refuse to draw baths for and administer treatments to patients of another race. Under these circumstances, it seems very necessary to provide separate and equal facilities for both races, but as the number of colored people applying for treatment is not over one per cent. of the aggregate number of both races at present, it is not necessary to provide for the accommodation of a large number of colored people.

Minor Changes and Improvements in Bathhouses

After operating the bathhouses during the past season, some minor changes and small additions to the several plants seem necessary for convenient and economical management and the comfort of patients, such as improved ventilation, small changes or modifications in the steam and water systems, an additional swimming pool at Lincoln Park to meet the rapidly increasing demand for these very popular institutions and additional supplies of towels and other linen used in the baths.

Public Parks

A very necessary and important part of the development of the Reservation is the construction of a park system on the lines of those that exist at foreign spas. Parks are not only necessary to enable patients to take the exercise and out of door recreation that is essential in connection with hydrotherapeutic treatment, but they are also important in order to interest and amuse those who accompany patients to health resorts and who may not themselves be taking treatment. The success of foreign resorts is, in a remarkable degree, commensurate with the beauty and attractiveness of their public parks.

The Saratoga State Reservation has an area of nearly 400 acres, most of which is singularly adapted to park purposes, comprising beautiful water courses, slopes wooded with grand forest trees and possibilities for wonderful development at small cost. The former commissioners were able, by the careful and judicious use of the small sums placed at their disposal, to build very simple roads and paths, bridges and other erections and to set out more than 250,000 trees, which, in the near future will enhance the beauty of the Reservation. They also built an avenue, along which was planted a quadruple row of pine trees, extending from the Geysers to Prospect avenue, within the former limits of the village of Saratoga Springs, a distance of nearly two miles, which connected Geyser Park with Lincoln Park, and both these parks in turn with the streets of the village.

There has been planned, also, a system of measured paths for pedestrians, built upon different grades, to enable the administration of the famous Oertel hill climbing exercises for patients

suffering from diseases of the heart which are specially amenable to the mineral water treatment. These should be completed, as well as other plans for the improvement and development of the present park area, in a liberal way and so as to compare favorably with similar developments elsewhere.

Protective Measures Required

During the four years since the Commissioners of the State Reservation appropriated the lands that constitute the Reservation, they have accumulated a mass of data relating to the chemistry and hydraulics of the springs that exceeds all the information obtained for a hundred years before. This is of vital importance to enable them to take proper measures for the protection of the mineral water system. In European countries, large zones of protection have been thrown around the springs of the great spas by governmental decree, which in this country, where greater consideration is given to the rights of private owners, are impossible. There is no doubt that an area exists that ought to be acquired by the State for complete protection, and this can only be delimited in a satisfactory manner by further constant study of the facts, which will doubtless make necessary the drilling of several additional wells and the installation of apparatus for measuring water levels and temperatures and involves many observations and experiments. A liberal appropriation should be made for securing the most accurate data on all these matters.

Emergency Appropriation Necessary

The unexpectedly large sum required to refit the Saratoga Baths and renew the plumbing installation for the administration of mineral water baths made demands upon the funds at the command of the Commissioners which were not anticipated by their predecessors when the work of renovating the newly acquired Saratoga Baths property was begun. This expenditure resulted in a depletion of the fund for necessary improvements to property and the cost of the current administration of the Reservation and compels the Commissioners now to request the immediate appropriation of the fund for expenses of this character, previously specified by them as the amount desired at the present session of the Legislature for such purposes. A special reason exists for the

immediate appropriation of this fund in the fact that the Saratoga season will open much earlier than usual, in consequence of the date fixed for the meeting of the General Conference of the Methodist Episcopal Church, which will begin its sessions about the first of May next, and the meeting of the State Medical Society which is also to be held in Saratoga in the month of May. During the month of May, 1916, between 3,000 and 4,000 people from all parts of the country will be in attendance at this convention, and the work of the State in the development of the Saratoga waters and the facilities that have been provided for their use in the healing of disease will thereby be brought to the attention of many people, who, under normal conditions, would know little about them. If the bath houses are then ready to accommodate the business which will be offered to them, a great increase in the number of baths given and the amount of revenue derived therefrom will be realized, and the time hastened when the receipts of the State will be commensurate with its investment.

Throughout the country, at many places where mineral waters, non-carbonated and inferior in therapeutical value to those which belong to the State at Saratoga, exist, the individuals, corporations and municipalities that own them are developing them by liberal expenditures. The city of Ashland, Oregon, has just issued $225,000 of bonds for such purpose. A corporation with a capital of a million dollars is engaged in constructing bottling works at West Baden, Indiana. The Wayne Baths have just been completed at Detroit, Michigan, at an outlay of a half million dollars; and other similar developments are projected at Dawson Springs, Kentucky, and San Antonio, Texas, upon a large scale. Shall the State of New York permit private enterprise to seize upon such opportunities in other parts of the country while its own mineral water resources, immeasurably superior in their character and potentialities for the production of revenue, in the face of such opportunities, are permitted to languish?

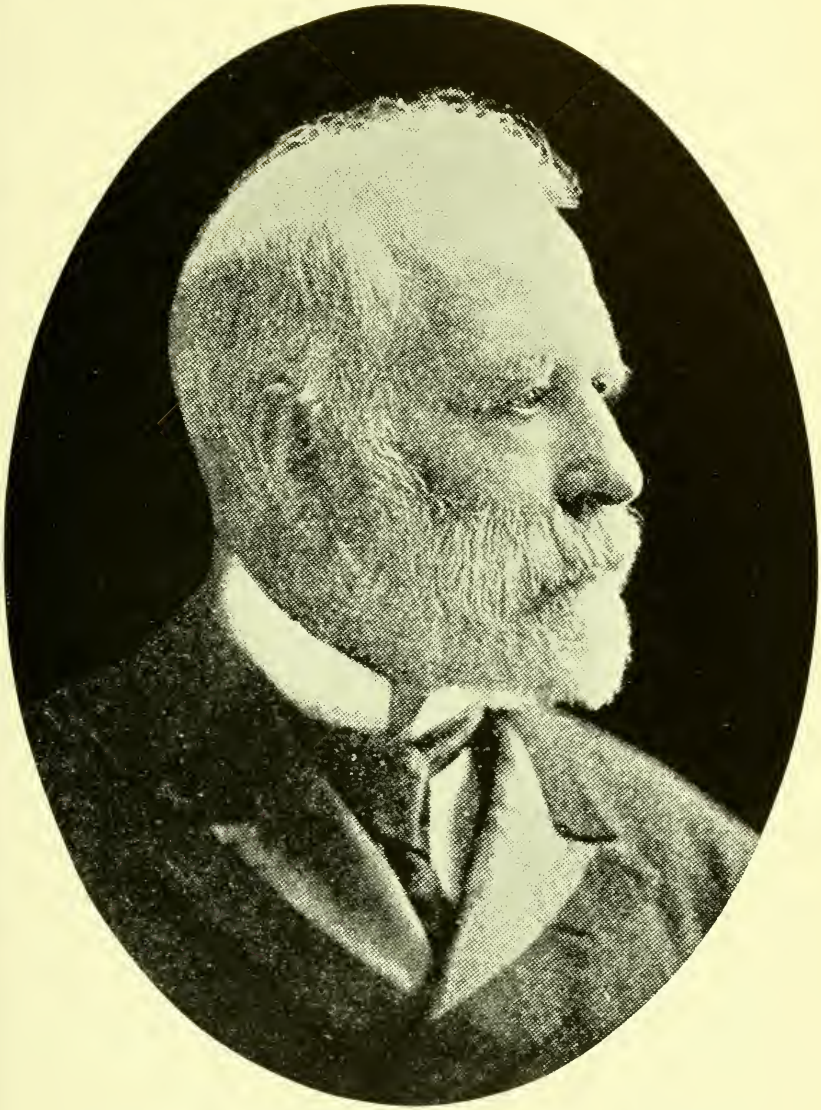
SPENCER TRASK MEMORIAL

Soon after the accession to office of the present Commissioners, there was unveiled a fitting memorial to the late Spencer Trask, the first Chairman of the Board of Commissioners of the State

TO THE MEMORY OF SPENCER TRASK MDCCCXLIV - MCMIX
HIS ONE OBJECT IN LIFE WAS TO DO RIGHT
AND TO SERVE HIS FELLOW MEN
HE GAVE HIMSELF ABUNDANTLY TO HASTEN THE COMING OF
A NEW AND BETTER DAY WHICH PROPHETIC VISION
HE FORETOLD FOR SARATOGA SPRINGS

"The Spirit of Life," by Daniel Chester French.

A Snap Shot Taken upon the Occasion of the Unveiling of the Bronze Statue, "The Spirit of Life," by Daniel Chester French, to Complete the Memorial in Congress Park, erected by the Citizens of Saratoga Springs, in Memory of Spencer Trask, the First Chairman of the Reservation Commission.



The Late General Benjamin F. Tracy, Former Commissioner

Reservation at Saratoga Springs, whose untiring labors contributed in no small degree to the rescue from threatened extinction of the natural mineral springs of Saratoga and the establishment of the Reservation upon a secure basis where it is believed the mineral water supply will forever be secure from any commercial exploitation that will be likely to menace its integrity. This memorial, a beautiful statue of an ideal figure representing the "Spirit of Life," designed and executed by the distinguished sculptor, Daniel Chester French, adds a great attraction to the new park system of the city of Saratoga Springs and gives it a character in keeping with the beautiful landscape architecture of Charles W. Leavitt.

Death of General Tracy

A few weeks later, another memorable event took place which cast a gloom over all who had been connected with the work of the Commissioners. This was the death of the Honorable Benjamin F. Tracy, which, although it took place at the end of a long and honorable career, saddened the hearts not only of his personal friends and the members of his immediate family but of those who had participated with him in the work of establishing the Saratoga Reservation and accomplishing the objects sought by the Legislature in its creation. The present Commissioners endeavored to give expression to their appreciation of his important part in the consummation of this work by the following preamble and resolution, which was passed at their meeting held on the 7th of August.

> Whereas, Intelligence has been received of the death of Honorable Benjamin F. Tracy, for more than five years a member of this board, which took place at his home in New York City on the sixth day of August instant; and,
>
> Whereas, It is our belief that these years of constant attention to the formation and development of the Reservation, on the part of one whose commanding abilities and versatile gifts had won for him distinction as a soldier, a jurist and a statesman, at a time when his intellectual powers had reached their highest maturity and his judgment had been ripened by a long life of broad and varied experience, was a principal factor in the successful accomplishment of the task

assigned by the State to the Commissioners of the Reservation at Saratoga Springs of preserving the mineral springs of Saratoga and restoring them to their former natural condition; and,

Whereas, The inflexible integrity of his character was mellowed by a kindliness and consideration for others that have left fragrant memories of his service among all who were associated with him in the prosecution of the work of this commission; it is therefore

Resolved, That we record in the minutes of our proceedings our deep sorrow at the death of one to whom the State is so greatly indebted for his invaluable and unselfish labors; whose memory we shall always cherish and would fain perpetuate so long as there remain citizens of our State to enjoy the fruits of the service which he rendered his fellow citizens, freely and without hope of pecuniary reward.

Departmental Reports Appended

Appended to this report will be found the report of the Secretary of the Board, stating in detail the financial transactions of the past year and its present financial condition; also the report of Mr. Charles G. Anthony, C. E., the consulting engineer, describing particularly the work of his department during the past year and the matters which should engage the attention of his department during the coming year; also a similar report from Mr. Herbert Ant, the chemist; also a report from Dr. Albert Warren Ferris, superintending director, setting forth the medical side of the work of the Board and the importance of the Saratoga waters as medicinal remedies; also a supplemental statement by Honorable Charles C. Lester, covering the advance made during the past year in securing a knowledge of the hydraulics of the mineral water system and the genesis of the mineral waters.

REPORT OF THE SECRETARY

December 31, 1915.

To the Honorable, the Commissioners of the State Reservation at Saratoga Springs:

In presenting the financial statement of this Commission for the year 1915, I beg first to call to your attention the fact that we have turned into the State Treasury this year the sum of $14,891.22, which is made up as follows:

Receipts from bathing business	$8,278 13
Net profits from bottled waters and drink hall	3,751 19
Net profit from gas sales	1,607 02
Miscellaneous receipts	1,254 88
Total	$14,891 22

an income which might readily have been added to, and by a handsome sum, had adequate facilities for the use of the mineral waters been seasonably provided; but, unfortunately, the lateness of the appropriation for the purchase and remodeling of the Saratoga Bath House delayed its opening until August 10th, and caused many patrons to seek treatment elsewhere. Additional business was also lost in the bottling plants by reason of insufficient machinery and the absence of operating conveniences to make possible the bottling of larger quantities of water during the busy summer months. The receipts of the bathing business as shown above represent the gross or gate receipts, against which we paid out from our regular appropriations operating expenses of $6,271.66, leaving a net profit from the operation of our three bath houses for the summer season of $2,006.47. The State realized, therefore, a net profit from the sale of bottled waters and gas and from the operation of bath houses of $7,364.68, an excellent result to be realized practically at the inception of the business when the crude working facilities with which we have at present to contend are considered.

Bathing business. In considering the receipts of the bathing business for the past summer we must not forget that, through lack of appropriations, it was necessary for the Commission to lease out, on August 15th, the Kayaderosseras and High Rock Bath Houses. The total business done at the three bath houses for the summer months, ending on October 1st, amounted to $10,459.85, compared with $5,230.44 during the same period in 1914, or an increase this year of $5,229.41, practically 100 per cent.

It is interesting to note that at the Lincoln Baths, a building converted into a bath house during the present year, the gross receipts for the season (July 5th to September 15th) amounted to $5,715.48, or a little over one-half of the total business. This indicates very forcibly the quick response of the public to improved conditions, and proves beyond doubt the confidence of the people of the country at large in the virtues of these natural waters and of their desire to avail of them if but offered the opportunity.

During the summer season a total of 10,350 treatments were given, of which 5,793 were given to females and 4,557 to males. These figures do not include the patrons of the outdoor swimming pools.

Bottled waters and drink hall. With an expenditure of but $1,660.83 for advertising, this business shows an increase in gross sales for the past fiscal year of $9,325.53. With a natural demand in existence for the cathartic waters a further substantial increase will undoubtedly be shown during the coming year without any increased expenditure for advertising. Some improvements are necessary before this business can be largely developed, among which a new bottling plant is of first importance.

Patronage in the drink hall shows an increase in revenue of 64 per cent, by which gain one can more readily appreciate this year's increased patronage of the mineral water supply.

Gas sales. Receipts from the sale of surplus carbonic acid gas for commercial purposes, which cover but a period of seven months, represent the converting into profit for the State of another of the natural resources of this Reservation, and indicate a further financial possibility for the State on its investment.

Sanitary drinking cups. The introduction of individual sanitary drinking cups in the drink hall and at the free stations has

Reservation Drink Hall in Winter Costume.

Despite the Sign This Cathartic Water on Account of Its Pleasing Salty Taste Is Drunk Freely by Travelers.

met with the fullest approval of the public. The extent of this business can best be expressed by the records of this office for the summer season in the matter of cup sales, which are as follows:

	CUPS SOLD
Hathorn No. 1 free station	81,977
Drink hall	73,700
Congress Spring free station	57,158
Columbian Spring free station	12,854
Hathorn No. 3 free station	8,808
High Rock Spring free station	2,301
Lincoln Spring free station	1,315
Soft Sweet Spring free station	1,196
Geyser Building free station	417
Total	239,726

The number of cups sold we estimate to represent but one-third of the total patronage at these springs; as, following the custom in vogue at the foreign spas, a large percentage of patrons bring their cups with them. At the Soft Sweet Spring and at other springs in isolated sections of the Reservation, the sales are small on account of the necessity for locking up cup machines when plants are not in operation to prevent their being damaged by mischievous or malicious persons.

Condition of Appropriations

The only appropriation made for this Commission by the Legislature of 1915 was that by Chapter 335 of the Laws of 1915, in the amount of $99,000, derived from the sale of bonds, for the acquisition of the Saratoga Bath House and to restore in part the moneys paid out from the original Land Fund as interest upon claims settled. From this, and from the original Land Fund referred to, we have a balance, as of October 1, 1915, of $101,534.10, to be applied in settlement of the claims of property owners whose lands have been taken for the Reservation, including the awards lately made by the Court of Claims to the Lincoln Spring Company and the Victoria Spring, incorporated,

amounting to $176,590.83 and $25,000, respectively, besides interest. The necessity for a Land Fund appropriation by the incoming Legislature is apparent.

Our working appropriation by Chapter 252 of the Laws of 1914 while showing a balance at the present time of $7,439.45, will be practically exhausted on January 1st, after payment is made of our December bills; therefore, if we are to continue our work, and prosecute our plans for an early opening of the 1916 season, demanded by the large conventions to be entertained in Saratoga during the month of May, it is important that we secure an emergency appropriation from the 1916 Legislature during the month of January.

In order that our annual report may conform with the Fiscal Year of the State, I am appending a list of disbursements only to October 1st, instead of for the calendar year, while the receipts are given for the entire year, in order to show justification for the opening statement of this report, but which will be changed next year to accord with the Fiscal Year.

Respectfully submitted,

LOUIS W. NOLAND,
Secretary.

REPORT OF THE CONSULTING ENGINEER

December 15, 1915

To the Honorable the Commissioners of the State Reservation at Saratoga Springs:

The year just passed has witnessed the most important progress the development of the Reservation has experienced. During this year most of the data collected during the first four years of the Commission's existence has been put to practical use.

In the last report of the Consulting Engineer, mention was made of several contemplated improvements, and a detailed description was given of most of them. As practically all of the contemplated work has been completed since the last report was submitted, the present report must of necessity deal with the results obtained during the season's operation of the completed structures.

Before any of this work was contemplated, during a period of four years of the Commission's existence, a series of observations and experiments was systematically prosecuted. The many complex factors entering into the constitution of the Reservation were diligently studied, and the characteristics of all the springs, both physical and chemical, were determined. The best expert advice was obtained, from Europe as well as America. The aid of the State Board of Health was solicited, and a chemist and bacteriologist was detailed for experimental work on the Saratoga waters.

In connection with this investigation I made a visit to Europe in 1913 and spent considerable time abroad, investigating the bottling works, drink halls and bathing establishments at Vichy, Kissingen, Bruckenau, Saline, Wiesbaden, Nauheim, Homburg, Harrogate and Bath. All of the work completed last year and covered in this report is a direct outgrowth of the exhaustive investigations inaugurated by the Commission soon after its appointment by Governor Hughes.

LINCOLN BATH HOUSE

The Lincoln Bath House is perhaps one of the most gratifying results of this year's work of construction. At the time the European war developed, the Commission faced a new problem of furnishing bath facilities for Americans who were no longer able to visit the foreign spas and receive the benefits to be derived from their waters.

I reported to the Commission last year that, with the expenditure of a moderate sum of money for improvements and alterations to the old Lincoln Spring Building, it could be converted into a good bath house. This building was one of the old structures taken by the State, and was originally used for liquefying and marketing CO_2 gas derived from the mineral waters.

This bath house was completed in June, 1915, according to designs and specifications drawn by the Engineering staff of the Reservation Commission, and approved by the Commission and the State Architect, and was opened for business July 2, 1915. As was to be expected in operating for the first time a new plant involving principles that were untried, a few minor difficulties were experienced. Most of the equipment was of a special design, and tried out here for the first time. The entire plant could be looked at in no other way than as largely experimental; yet the results obtained were very gratifying; and I believe that I can conscientiously say that in no other place in the world can a carbonated bath be found equal in strength to those provided at the Lincoln Bath House.

The patronage of this bath house was so far beyond our expectations that the mineral water supply proved inadequate. It is absolutely imperative that our system for drawing and storing mineral water be enlarged, so that we can adequately care for the increased patronage to be expected during the coming season. I consider increasing the fresh water supply and enlarging the mineral water supply to be two of the most important undertakings that confront the Commission; and it is absolutely imperative that these two water systems be finished at the earliest possible moment after work can be commenced in the Spring.

Reception Room of the Kayaderosseras Baths.

Indoor Swimming Pool, Kayaderosseras Baths.

The two outdoor swimming pools, surrounded by dense shrubbery, a velvety lawn and a sand court, constructed at the Lincoln Bath House, proved very popular, as was predicted last year. In fact, during the month of August they were worked beyond capacity, and new dressing booths should be added to take care of the increased patronage to be expected for next season.

At the time the Commission advocated the construction of these swimming pools, we were alive to their dangers; and precautions were taken to construct adequate safeguards. The fact that these pools proved a success from a hygienic standpoint is a matter of great importance. The bacterial count on these pools varied from 75 to 300 bacteria per cubic centimeter. This is an important fact when we consider that bacterial counts in city water supplies as high as 5,000 per cubic centimeter are found. These excellent results were obtained by means of a refiltration system. Essentially, the term "refiltration" means nothing more than circulating the pool water through a filter.

Kayaderosseras Bath House

The appropriation for the reconstruction and equipment of the Kayaderosseras Bath House was secured too late to enable the Commission to open this bath house for public use at the time they desired. It was finally completed and opened to the public on August tenth, after the season was well advanced. Judging from the results at the Lincoln Bath House, the Kayaderosseras Bath House would have had a large patronage during July, had we been able to complete the alterations in time, and the delay resulted in substantial loss.

Considerable trouble was experienced in the construction work at this building owing to the fact that the building settled considerably, necessitating the removal of a great number of pipes and a large amount of shafting, and also the retiling of practically all of the bath rooms. Another unforeseen and unavoidable result of these troubles was to cause the Commission to run considerably over the Engineer's estimate of the expense of the improvement. The equipment, however, is of so complete a character and the results obtained there last Summer were so uniformly good

that, regardless of the expense entailed by the Commission, the investment has proved itself a wise one.

The growing patronage at the Kayaderosseras Bath House this year proves conclusively that we must increase our mineral water supply at this point also.

HIGH ROCK BATH HOUSE

The results obtained at the High Rock Bath House for the year 1914 were uniformly good, and the installation as it existed at that time gave a supersaturation of gas in the water of 33 per cent, or 8 per cent more than was regarded as necessary to secure the therapeutic effect sought; and it could be said that the baths then given at this bath house were superior in this respect to those at Nauheim and Bruckenau and equal to those at Kissingen and Homburg. However, it was deemed advisable to make some changes in equipment in order to increase the supply of mineral water. This was done early in 1915, immediately after the completion of the High Rock pit, and there was never a shortage of mineral water there during the following season. I recommend, however, to the Commission that an auxiliary system be installed at the High Rock Spring, in order that no such mischance as the breaking of a pump or the disabling of a motor may result in a shortage of mineral water at the bath house.

SOFT SWEET SPRING BOTTLING WORKS

In my last report I gave a complete outline of the construction contemplated to develop a pure sweet water spring on the Reservation. The plant so described was constructed and placed in operation during the year 1915. Being a new plant, certain minor troubles were experienced, but were soon remedied, and now I think it is safe to say that the Commission possesses a plant capable of delivering a large supply of pure, sweet, wholesome water, free from any sign of bacteria or pollution. The bottling works proved very popular, and were visited throughout the summer by many people.

I believe that the Commission is to be congratulated on the fact that no plant in the United States is putting a superior water on the market. The accompanying photographs give a very

Ancient Willows Shade and Guide You to the Soft Sweet Spring.

Sanitary Washing, Sterilization and Filling of Bottles at the Soft Sweet Spring.

good idea of the precautions taken to prevent contamination, and I believe they will prove to the critical as well as the casual observer that the plant is most complete and sanitary.

Congress Spring

The work begun in 1914 to reclaim the old Congress Spring was satisfactorily completed in 1915. Considering the fact that this was the most important and best known spring Saratoga ever possessed, it can be said that its reclamation is one of the most important things the Commission ever accomplished.

To recover this spring it was necessary to penetrate to a depth of 300 feet, through layers of what we found to be unusually hard and flinty rock. This work was accomplished, the old Congress Pavilion was removed, and a sunken garden, with velvety lawns and beautiful red Roman stone steps, leading down to a level of fourteen feet below the surface of Congress Park, was constructed. The flow of the spring when first reclaimed was but three quarts per minute. At the end of the season the flow had increased to seven gallons per minute. The increase in flow did not decrease the mineralization of the water, which contains about 6000 parts per million of soluble mineral salts. This sunken garden about the Congress Spring proved one of the most popular places on the Reservation, as many as 10,000 people visiting the spring daily during August. The accompanying photographs will show the artistic results obtained.

The construction about this spring is of the same character as that at Homburg, but on a more elaborate scale and of a more difficult nature. One of the most interesting features is the method used in removing storm waters from the lower levels of the garden. The bottom of the depression is several feet below the adjacent water courses, and the water is removed by means of two large centrifugal pumps, capable of discharging 800 gallons of water per minute, and operated automatically. This system worked successfully throughout the season.

Retubing Wells

Dr. Haertl of Bad Kissingen called the attention of the Commission to the fact that the iron castings and tubes in our wells

and springs were not efficient, and that European spas had been very successful in using copper or phosphor-bronze for these purposes. At Kissingen and Bruckenau I found the wells tubed and cased with phosphor-bronze, an alloy of tin and copper only; while at Nauheim, Weisbaden, Homburg and Vichy pure copper was used. It was found to be impossible to procure phosphor-bronze of the proper amalgam in this country; and, after a careful study of the situation, we decided to tube the wells at Saratoga with pure copper.

At present the following wells have been supplied with copper tubing: Hathorn No. 1, Hathorn No. 2, Coesa, Orenda, Geyser, Minnonebe, Congress, Emperor and High Rock. The results obtained have been uniformly excellent.

Rearrangement of the Hathorn Building for Use as a Drink Hall

At the beginning of the year 1915, it was found that the Commission had neither a suitable site for a drink hall nor sufficient funds to procure such a site or erect such a structure; and the interior of the old Hathorn Pavilion was therefore remodeled to meet the pressing need for a modern and conveniently equipped drink hall. A large multiple drinking fountain was erected in the building and a new marble counter was constructed from which could be served the various mineral waters bottled in the Reservation's bottling plant. In addition to the multiple drinking fountain a warming table was installed, so that mineral water could be served warm on physician's prescriptions. This warming table proved very popular, and its capacity should be trebled in order to meet next season's demands.

An ornamental partition was designed and constructed in order to provide better facilities for visitors at the free entrance. This proved wise, as thousands of people visited the free entrance throughout August, each day, who could not have been accommodated under the former arrangement. The appearance of the building, also, was improved and rendered more pleasing and inviting.

Park Development Work

I am fully convinced that no bathing resort can attain to a proper financial success unless it is surrounded by parks properly

designed and extremely attractive. The value of the mineral water treatment is due not only to the curative properties of the water, but also to the release from home, professional and social duties which is secured by a visit to a health resort. The psychological aspect must be considered and provided for. These facts were no doubt considered by the Commission when they persuaded the village authorities to provide the unique and beautiful park in the centre of the town, and likewise when they themselves created the High Rock Park, still much too small, the Lincoln Park of sixty acres and the Geyser Park of two hundred fifty acres, with its exceptional natural advantages of scenery and varied forestation.

The Commission accomplished much with the small fund for park development at their disposal, but unusual efforts should be made during the coming year to effect a development of the park system adequate to fit it for the important part it will be called upon to play in the creation of a great health resort.

In order to beautify the grounds adjacent to the Lincoln Bath House, considerable planting should be done next year, and it is also desirable that additional work be done on the plantation and on the walks and roads in all of the Reservation parks, all of which I consider to be of unusual importance in the proper development of the State's possession at Saratoga and to the ultimate success of the whole enterprise.

Scientific Observations, Tests and Experiments

In 1911 the Commission started a series of observations and experiments on the wells and springs on the property included with the State Reservation to determine the effects of pumping, and changes following its cessation. All of these have been continued throughout the year, and efforts have been made to secure additional scientific data. In order to make this possible a portable gasoline power plant and a Keystone drilling machine were purchased by the Commission for the use of the Engineering Department. Immediately after securing the driller, an experimental bore was commenced on what is known as the Smith Property. The results of this experiment are shown in the Chemist's Report. The portable power plant proved very useful to the

department and was in operation on various projects carried on by the engineering staff.

SUMMARY AND RECOMMENDATIONS

I trust that it is apparent from the above report that during the period covered by this report the engineering staff has made steady progress in solving the varied and complicated problems of the Reservation, and in executing the designs approved by the Commission. The progress of the Reservation has not been such, however, that we can compare it favorably with the development of similiar spas abroad. The managers of European spas point with pride to elaborate casinos, bath houses, drink halls, bottling works and palm gardens, located in the midst of elaborate park systems in such a manner that the visitor is at once impressed and delighted. Thus the elaborate and expensive development proves to be true economy and renders natural rescources productive of great revenue to the State.

I venture to suggest that a bottling works be at once constructed at Saratoga Springs. There are so many waters of merit within the boundaries of the Reservation, and so constant a demand for them, that a bottling works equal in beauty and efficiency to that at Poland Springs or White Sulphur Springs is a real necessity.

A large and complete drink hall should also be constructed. The bathing facilities, as they exist, are capable of meeting the present demand. A new and properly elaborate bath house, completely furnished, is essential to the ultimate success of the development of the mineral waters and the realization of the profits they are capable of producing to the State.

Our scientific investigation has proven beyond a doubt that the mineral water springs have substantially recovered from the effects of the exhaustive pumping carried on by the gas companies in the past, and that there is an ample supply of excellent carbonated mineral water, equal to any in the world. The right foundation is surely here. It only remains for the State of New York to erect upon it a suitable superstructure.

Respectfully submitted,

CHAS. G. ANTHONY.

Consulting Engineer.

Water Analysis Room of State Reservation Laboratory, Hathorn Building.

REPORT OF THE CHEMIST

December 13, 1915

To the Honorable, The Commissioners of the State Reservation:

Since the creation of the Reservation Commission at Saratoga Springs, the line of chemical investigation has been confined to weekly or monthly partial analyses with less frequent complete analyses of the various springs. After a period of four years of observations made by the engineering staff in co-operation with the staff of chemists of the State Department of Health, it was deemed necessary to establish a laboratory wherein a more extensive line of research and experimentation might be taken up. In June of 1914, a laboratory was equipped for this purpose and during the period that has since elapsed extensive construction work coupled with the increasing demand for Saratoga bottled waters and for better facilities for giving mineral baths has added many other duties and problems to the routine of the chemical laboratory. The construction of the Lincoln Bath House with its outdoor swimming pools, the renovation of the Kayaderosseras Baths, the construction of a modernly equipped plant for the bottling of the Soft Sweet Spring Water, and the recovery of the old Congress Spring have all presented new fields for investigation and study.

Bath Houses

The new Lincoln Bath House, the Kayaderosseras and the High Rock Baths were all open for the summer season of 1915 and furnished carbon dioxide mineral baths of any desired strength according to the prescription of the physician. Complete mineral analyses of the different bath waters were furnished so as to facilitate the prescription of baths by the medical profession.

During the past summer at all of the bath houses courses of baths following the treatment at Nauheim were administered with the Saratoga waters and occasionally, under the direction of a physician, a brine was used reinforced by the addition of sodium and calcium chloride. It is a question yet to be decided by the

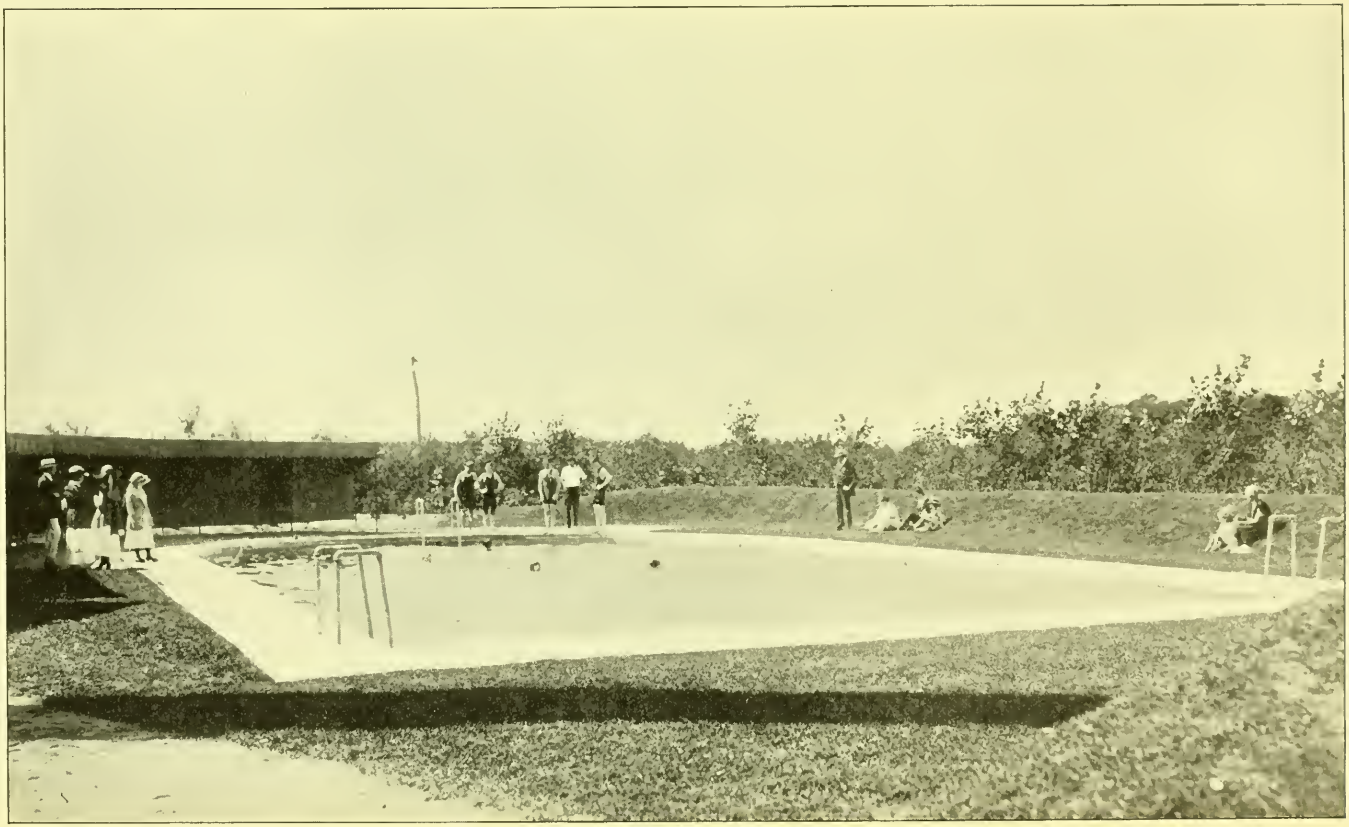
medical profession whether the addition of reinforcing salts is advantageous or necessary for the best results from the "Nauheim System of Baths." While there is plenty of evidence to show that the baths given at Nauheim with their stronger brines have accomplished gratifying results, we have had similar gratifying experiences with weaker brines at Saratoga.

Perhaps the experience that we have had is not sufficient for us to say that we can accomplish equally good results with weaker brines, especially, in the face of the long history of cures recorded at foreign Spas, effected with re-inforced waters. But, it seems to me, that with the great successes we have experienced it is essential for the medical profession to get definite scientific data upon this subject. If we are to give strong brine baths, by the addition of salts to our Saratoga waters, we must add them in a scientific way so as not to destroy the efficiency of the gas bath. The dissolving of large quantities of salts in the bath results in the loss of much gas and reduces the supersaturation from thirty-five to fifteen or twenty per cent. The Chemist and Chief Engineer have devised an apparatus that will furnish the salts required, in solution and under pressure, whereby the gas content of the bath can be maintained. The supersaturation of gas is the most important feature of the Nauheim system.

At the High Rock Baths, in the early part of the season when a new water supply had been installed, there was trouble in obtaining baths that were clear and yet had the required gas content; but this condition was soon corrected and a fine bath was administered during the rest of the season.

At all of our bath houses, clear effervescent baths, perfect in their physical and chemical characteristics, and I might say, from all the information I can collect, superior in appearance to those at Nauheim, were given. The waters at Nauheim are red and turbid when drawn in the tub resulting from the separation of iron caused by the escape of gas during long storage. While there is apparently no complaint offered at Nauheim on this account, at Saratoga people have refused to get into a bath that has been in the least discolored from similar causes.

The outdoor pools at the Lincoln Bath House were very popular and very well patronized. The water for these pools was fur-



One of the Outdoor Swimming Pools at the Lincoln Baths.

nished from two large cisterns containing pure spring water. By reason of a somewhat limited supply it was impossible to keep a steady flow of fresh water running through the pools at all times. But in order to provide a pure, safe water a system was installed to cause the constant circulation of water from the tanks through a filter, where the water was purified, and then back into the tanks again. Bacteriological tests were made weekly. The total count of organisms per cubic centimeter ranged from 75 to 350 when the filter was working properly.

The Soft Sweet Spring

The Engineering Department early in the Spring completed the new bottling house for the marketing of the Soft Sweet Spring water. This plant is equipped with every modern appliance for the perfect sterilization of bottles and crowns. The bottling and sterilization is carried on under the direct supervision of the laboratory. Bacterial and chemical control is continually exercised in order to assure a pure soft drinking water of the highest sanitary quality.

The following is the sanitary analysis of the water made July 29, 1915.

Nitrogen as Nitrites	trace	
Nitrogen as Nitrates	0.10	
Nitrogen as Free NH_3	.006	Bacteria of the Coli
Nitrogen as Albumnoid NH_3. .	.008	type not present
Chlorine	2.50	in 10 cc. volumes
Oxygen consumed	.10	tested. Count on
Total hardness	70.00	gelatine 4 per cc.
Alkalinity	69.00	
Total solids on evaporation	112.00	

This water compares favorably with the best soft spring waters on the market today and needs only proper advertising to increase its sales and make it a source of large revenue to the State.

The Congress Spring

The restoration of the old Congress Spring has been a long felt need of the Commission, inasmuch as its water was so popular and generally known to people throughout the country. By the use of the most scientific methods available, this spring has been

restored and a sunken garden built around it adding much to the beauty of Congress Park where it is situated. In the recovery of this spring, samples of rock were taken from each of the different strata encountered and a complete analysis made of each. The water of the well was tested every five feet, both for mineral and gas content; and the best vein of water was selected which without doubt is the old Congress vein. The flow at first was quite small, amounting to only three quarts per minute; and this rate of flow continued until late in August when suddenly it increased to seven gallons per minute and then decreased to five gallons at which rate it is now flowing.

In the construction of the Sunken Garden, great volumes of ground water were encountered and pumped out continuously to enable the work to proceed. In doing this, the equilibrium of all the surrounding ground water was disturbed and the level of the mineral water in the Congress bore was greatly lowered. However, upon completion of the work the water gradually returned to its former condition though the change could not be noticed until the latter part of August and was not completed until the early part of November. When the increase in flow was first observed, water was detected leaking through between the floor and the side walls of the Sunken Garden, showing that the ground water was rising and resuming its normal condition. The gas content of this spring ranges from a supersaturation of 45 per cent to 54 per cent, making a carbon dioxide water exceeding any in the village in strength, and equaling some of the stronger mineral springs in Geyser Park. The complete analysis is listed in the table of analyses further on in the report.

Recently a label from an old Congress Spring Water bottle was brought to me and my attention was called to the complete analysis printed on it. Underneath the label was a statement that to each gallon of Congress Spring Water there was added 280 grains of sodium chloride. After deducting this salt addition from the total salt stated in the analysis and comparing our present Congress water with it I found the two waters were practically identical.

Smith Well Test Bore

The Commissioners have long desired a clearer knowledge of the general mineral water basin in the district surrounding Sara-

toga Springs and to learn more with regard to the general flow of the mineral water. All data at hand at the present time seem to point to the conclusion that the flow of brine is from the south and west and that in its flow northward through the dolomites or calciferous sandstone additional salts, such as lime and magnesia are dissolved. At Ballston, waters containing the strongest brines are found carrying in them the smallest proportions of lime and magnesia salts. Approaching Saratoga a decrease in sodium chloride is noted with an increased proportion of lime and magnesia salts until, in the village of Saratoga Springs itself, are found waters with the highest proportions of lime and magnesia, and the smallest sodium chloride content. A small piece of land was secured a short distance to the south and west of Hathorn No. 2 spring which is furthest south and strongest in its chlorine content of any of the Saratoga Springs, in order that a test bore might be made to secure further data. This bore was made and water far from the ordinary and contrary to all expectations was secured. The bore is a six inch bore 490 feet in depth, and the same method of investigation was used as in making the Congress bore. The rock encountered to the depth of 370 feet was a soft shale, rich in hydrogen sulphide gas; and from that point to the bottom were found siliceous limestones. When the drilling was stopped the dolomites had just begun to appear.

Tests were made on the water every ten feet to the bottom; and at no point was there found a chlorine content of more than 108 parts per million, while the alkalinity was 4250 parts, or equivalent to that of Hathorn No. 2 spring. A complete analysis of the waters of this spring showed the presence of nearly 4000 parts of sodium bicarbonate and the entire absence of sodium chloride. The absence of salt is probably due to the fact that the bore was not carried to a point below the dolomite formation where the brines are usually located and the large bicarbonate of soda content might have been formed from the reaction of carbonaceous material upon the sulphates in the shale as follows:

$$Na_2SO_4 + 2C = Na_2S + CO_2$$
$$Na_2S + H_2CO_3 = Na_2CO_3 + H_2S$$
$$Na_2CO_3 + H_2CO_3 = 2NaHCO_3$$

The sodium sulphide at first formed is rapidly converted by CO_2 in solution to sodium carbonate and hydrogen sulphide; and, upon further addition of carbonic acid, the carbonate is converted into bicarbonate as in the last equation. The gas found in the water upon analysis shows carbon dioxide with some hydrogen sulphide and traces of hydrocarbons. The analysis of the water as it is now shows a water quite like the French Vichy.

In comparing the analysis of the Smith Well with that of the French Vichy, it was observed that certain salts, such as potassium bicarbonate and sodium chloride are found in the French Vichy, while potassium chloride is absent. In the Smith Well there is a small amount of potassium bicarbonate, a fairly large amount of potassium chloride and no sodium chloride. Although a comparison of these analyses shows different elements in combination with the sodium and potassium in the two analyses, I do not believe that these differences really exist in the waters themselves, but that the variance is due wholly to the methods of calculating the probable combinations of the different elements as found upon analysis. Many different methods have been used in making such computations, so it would be hard to find identical results by any two chemists for the same water, unless the same method of calculation happened to be used by each. The methods of the U. S. Geological Survey are used in this laboratory, and are the most satisfactory for the computation of analyses of such waters as we have at Saratoga.

To test the accuracy of the method, water from the Smith Well was examined miscroscopically, and a study of the crystal forms made. No sodium chloride crystals could be found after the examination of several slides, while potassium chloride crystals were very distinct. This result agreed with the compounds as computed, and showed that the chlorine should be assigned to the potassium first.

If this method had been used for the combinations in the French Vichy, potassium chloride would have been tabulated with the potassium bicarbonate, but no sodium chloride.

It would be interesting to carry this bore down through the dolomite and see if the brines would be encountered and if the conditions met with at present are due to the separation of the ground waters from the mineral by impervious rock or clay.

Relationship of Ground Waters to Mineral Waters

There is a peculiar relationship between the ground waters and mineral waters at Saratoga Springs The district south of the village, extending from the Lincoln tract to Coesa Valley, has a distinct line of division between the two water systems. This line of division is a stratum of clay in most places and an impervious rock stratum in others.

At the Lincoln the ground water is soft and very low in chlorine content, as are all the surface springs to the south to the Coesa Valley. Our Soft Sweet Spring is from this water table and is almost entirely free from mineral. However, the mineral springs found in this district are the stronger mineral springs of the Reservation. These facts seem to prove that there is little or no percolation of ground water into the mineral and vice versa.

In the village where the mineral fault outcrops and runs nearer the surface, we have a very different condition. Here the weaker mineral waters are to be found and harder ground waters.

Of a series of twelve fresh water springs, nine of which are located in Congress Park and three in other sections of the town, the lowest chlorine to be found was four parts per million, the rest ranging from twelve to seventy-eight parts per million. The normal chlorine for this district should not be more than 1.50 parts per million. In the village there is but little clay; and the rock, in being pushed up to the surface, has been split and rent, so that there is every opportunity for the admixture of mineral with ground water and ground water with mineral. The strength of the mineral springs depends upon the thoroughness with which these two water systems are separated from one another.

Complete analyses of the following springs have been made during the year: Geyser, Minnonebe, Hathorn No. 2, Orenda, Soft Sweet, Putnam, Gurn, Crystal Rock, Royaneh, Flat Well No. 2, Lincoln, Hathorn No. 1, Patterson and Congress. Some of these are tabulated in the following table.

Respectfully submitted,

HERBERT ANT,
Chemist.

ANALYSES OF REPRESENTATIVE WATERS OF THE RESERVATION

CHEMICAL COMBINATIONS	BOTTLED WATERS					NOT BOTTLED	
	Coesa	Orenda	Hathorn No. 2	Minnonebe	Geyser	Smith	Congress
Ammonium chloride	35.83	22.74	42.82	24.47	22.95	26.75	6.89
Lithium chloride	39.64	32.71	44.52	10.80	14.20	17.13	30.71
Potassium chloride	609.18	363.17	920.57	195.80	222.13	161.15	191.13
Sodium chloride	5,043.53	6,298.49	10,645.75	2,090.72	2,172.97	none	2,046.44
Potassium bromide	29.67	34.90	60.00	7.50	15.00	16.00	7.50
Potassium iodid	1.36	2.00	3.50	1.00	1.25	3.00	.50
Sodium sulphate	8.37	.97	6.70	12.78	12.13	trace	22.52
Sodium metaborate	trace	trace	trace	trace	trace	trace	trace
Sodium nitrate	trace	.28	trace	trace	trace	trace	trace
Sodium nitrite	trace	trace	trace	trace	trace	trace	trace
Potassium bicarbonate	none	none	none	none	none	1.48	none
Sodium bicarbonate	830.34	208.67	344.51	1,864.74	1,607.15	3,979.62	245.87
Barium bicarbonate	13.56	3.28	41.11	14.44	8.89	4.28	10.89
Strontium bicarbonate	2.74	trace	4.07	2.98	2.06	trace	trace
Magnesium bicarbonate	1,501.22	1,327.04	2,868.07	898.89	785.83	826.43	1,207.69
Calcium bicarbonate	2,786.01	3,190.00	3,953.17	1,574.98	1,849.54	1,070.40	1,832.19
Ferrous bicarbonate	25.48	16.38	21.59	20.38	26.34	333.85	46.15
Mangano manganic oxid	trace	none	none	none	none	none	none
Alumina	1.18	7.64	6.31	4.85	1.17	61.29	8.38
Silica	8.50	7.85	9.60	10.80	16.30	32.00	28.30
Total solids	10,956.62	11,523.32	18,972.29	6,735.13	6,757.91	6,533.20	5,684.36
Date of sample	December, 1915	August, 1914	March, 1915	March, 1915	December, 1914	September, 1915	May, 1915

TABLE WATERS
(STILL)
SARATOGA SOFT SWEET

A Pure Table Water

TABLE WATERS
(SPARKLING)

GEYSER

MINNONEBE

Alkaline
Saline

Slightly Diuretic

Increases
Appetite and
Assists
Digestion

CATHARTIC WATERS

HATHORN No. 2

Strong Saline
Tonic
Cathartic

No Discomfort
No Weakening

ORENDA

A Delicious
Refreshing
Laxative
Tonic and
Alterative

Very Closely
Resembles
the Famous
Old Congress
Spring Water
when at
its Best

COESA

Efficient
Alkaline
Saline
Laxative
and Tonic

These Three Waters
Charged with
Carbonic Acid Gas in
Nature's Laboratory

Coesa Spring Spouting

Analyses of Representative Waters of the Reservation

CHEMICAL COMBINATIONS	Bath Waters		
	Lincoln	High Rock	Hathorn, No 1
Ammonium chloride	11.93	5.73	23.74
Lithium chloride	27.62	31.48	27.55
Potassium chloride	463.52	73.42	503.50
Sodium chloride	3,136.35	325.63	3,662.99
Potassium bromid	19.50	8.30	22.00
Potassium iodid	1.00	2.10	1.50
Sodium sulphate	trace	45.03	6.54
Sodium metaborate	trace	trace	trace
Sodium nitrate	trace	3.21	0.12
Sodium nitrite	trace	trace	trace
Potassium bicarbonate	none	none	none
Sodium bicarbonate	1,368.99	889.13	490.05
Barium bicarbonate	7.12	1.24	10.45
Strontium bicarbonate	trace	none	trace
Magnesium bicarbonate	1,301.02	438.40	1,335.59
Calcium bicarbonate	1,887.10	1,226.83	2,288.92
Ferrous bicarbonate	39.81	55.05	27.26
Mangano manganic oxid	none	none	none
Alumina	15.12	3.60	1.77
Silica	44.10	25.30	12.75
Total solids	8,323.18	3,134.25	8,414.73
Date of sample	September, 1915	September, 1914	May, 1914

REPORT OF THE SUPERINTENDING DIRECTOR

To the Honorable, the Commissioners of the State Reservation at Saratoga Springs:

GENTLEMEN: The confident expectations of those who had studied the subject here and in foreign countries were realized during the past year, when the eyes of many invalids were turned toward Saratoga Springs, and a large number of patients presented themselves for treatment, by means of the internal use of the mineral waters, and also to a large degree by their use for baths, consequent upon the restoration of the natural springs, as effected by your Commission in pursuance of your statutory duties, as stated in the enabling legislation of the past few years.

Allusion has been made in previous reports to the difficulties resulting from individual ownership of springs, to the keen rivalry that was displayed, and to the fact that in by-gone years few people used the mineral waters rationally, or for a definite period under medical guidance. With the organization effected by your Commission, accurate prescription and accurate administration of the waters was largely secured this year, with the result that wide benefits were enjoyed by the patients who came to Saratoga Springs for treatment.

The season for treatment of patients, while increased somewhat from last year, is still very brief, lasting only from the first of June until the latter part of September. These limits are somewhat determined by custom, by the usual vacation periods, by the need of a modern year-round hotel, and by the discontinuance, early in September of some of the principal and favorite railroad trains. There have been few patients seeking treatment during June, although it is perhaps the most delightful month of the year. Last July was unprecedentedly rainy and somewhat cold, thus deterring many who would otherwise have taken advantage of the State's provision at Saratoga Springs. With these facts in mind, the very large number of treatments given is the more encouraging and somewhat surprising to the average student.

At the High Rock Bath House, between May 30 and September

Electric and Hot Air Cabinets, Kayaderosseras Baths.

12, the dates of the opening and closing of this establishment, there were 4,610 treatments given, consisting of mineral baths and a very few Saraghtoghie (Nauheim style) baths, since no provision can be made for the proper handling of patients desiring the latter style of baths, in the absence of rest rooms and comparative quiet.

At the Lincoln Bath House, between July 3 and September 15, the dates of opening and closing of this house, 4,446 treatments were given, including Plain Cleansing Baths, Mineral Baths, Saraghtoghie Baths (Nauheim style), Neuro-vascular Training, Colon Irrigations and Massage. A considerable number of the Nauheim style of baths was given, in many instances to patients who had previously been treated at foreign spas, no longer available because of the condition of war which prevails throughout Europe.

At the Kayaderosseras Bath House, between August 5 and October 1, 1,546 treatments were given including the same variety as already enumerated for the Lincoln Bath House, omitting Colon Irrigations and adding Eliminating Treatments by means of the Electric Light Cabinet and Douche. In all, 10,312 treatments were given during this very brief portion of the year. This is but an indication of the need for the provision the State has made, and of the future increasing popularity as well as the widening area of medical assistance to those who can benefit by the use of natural remedial waters. The question arises: How wide is the need? The answer can be reached only by examining into the statistics of those interested in life extension. The effect of modern life upon the average individual, whether an industrial worker, a day laborer or a brain worker, is generally damaging. Improper habits of eating, disregard of exercise, curtailment of sleep, and the use of brain and heart stimulants (such as tea, coffee, alcoholic beverages and tobacco) combine to cause deterioration early or late. Many of the conditions that are usually considered to be necessary penalties of age, in fact most of the so-called "diseases of old age," are due to entirely preventable causes and agencies. The preservation of efficiency and the acquirement of longevity depend very largely upon hygienic habits of living, formed in early youth. If the formation of these good habits

be neglected, organic impairment will certainly be apparent in the third decade of life and increasingly thereafter, in a large proportion of the population. Relief and partial restoration may be possible in many cases: but only if proper methods of living are instituted, and if the deteriorating tissues are relieved of the action of toxic and other agencies which have been at work to produce the impairment from which the individual is suffering.

Dr. Eugene L. Fisk, of the Life Extension Institute of New York City, presents an interesting analysis of physical examinations of 1,000 industrial workers (foremen and skilled workers) in the Ford Motor Company, Detroit, side by side with the results of 1,000 examinations of employees of banks, trust companies and commercial houses in New York City. Following is the comparative table, abbreviated:

	Detroit Ford Industrial	N. Y. City Commercial
EMPLOYEES	1,000	1,000
AVERAGE AGE	32.7 yrs.	27 yrs.
PERFECT	.00%	1. %
IMPERFECT:		
Advice needed regarding physical condition or living habits	100. %	99. %
Referred to physician for treatment	69. %	81. %
Of those referred to physicians there were aware of impairment	10.15%	11.54%
Advice needed regarding living habits or physical condition, but immediate treatment not required	31.1 %	17.7 %
MODERATELY IMPAIRED:		
Referred to physician for treatment and report sent to physician	22.9 %	18.5 %
No physician or none given. Urged to seek medical treatment or guidance	39.9 %	58. %
SERIOUSLY IMPAIRED:		
Referred to physician for treatment and report sent to physician	3.6 %	2. %
No physician or none given. Urged to seek medical treatment	2.5 %	2.8 %

CLASSIFICATION OF IMPAIRMENTS

IMPAIRMENTS:	Ford Industrial	New York Commercial
Heart	3.5 %	16.2 %
Arteriosclerosis, thickened arteries	24.65%	42.4 %
Slight thickening of arteries	29. %	.....
High or low blood pressure	23.1 %	26. %

IMPAIRMENTS:		
Urinary, albumin, casts	45.6 %	39.8 %
Combined urinary and other serious conditions	26.6 %	24. %
Total urinary or circulatory conditions	72.3 %	.....
Nervous	.3 %	1.1 %
Lungs	5.7 %	2.9 %
MINOR TO MODERATE:		
Functional circulatory, pulse (rapid, slow, irregular)	21.6 %	14.8 %
Urinary	26.6 %	20.8 %
Digestive disturbances	9. %	7.3 %
Constipation	14.7 %	17.2 %
Anemia	.4 %	2.7 %
Errors in diet	54.1 %	59.8 %
Errors in personal hygiene	50.5 %	54. %

An increasing number of clinicians is convinced that many heart and arterial degenerations are due to the toxines produced in the digestive tract through errors in diet and disregard of exercise. We may therefore, in the table quoted, combine in our consideration the percentage of individuals suffering from arteriosclerosis, slight thickening of arteries, digestive disturbances, constipation, and errors in diet. From this consideration we easily comprehend the importance of diet and of the avoidance of the production of poisons within the body which may impair the vital organs. The startlingly early age of impairment of the 2,000 persons examined and analyzed appeals to every reader. It will be noted that the Ford industrials average 32.7 years of age, while the accounting and commercial house employees average 27 years of age, none of the industrials being in perfect health and but 1 per cent., or 10 of the entire group of 1,000 employees of banks, etc., being unimpaired.

The United States Commission on industrial relations investigated nearly 1,000,000 industrial workers in this country, and ascertained that the wage earners suffer an average of from eight to nine days of sickness per year. Similar figures result from similar investigations in the case of German and English industrial workers, and they may be considered as correct. Estimating the daily wages at two dollars, and placing the average cost of medical services at one dollar per day, the annual loss would amount to over $800,000,000, since there are approximately 30,000,000 wage earners in the United States.

The average of human life is increasing. It has now reached in this country a little over forty-five years. Outside of the United States of America, eleven countries show an average longevity of over fifty years. The gain in longevity has averaged four or five years in a century, until the commencement of the last hundred year term when it increased nearly fifteen years.

The inference from studies of this sort must be that if life can be brought nearer to the natural condition, and if natural foods and natural methods of treatment of ailments can be employed, the deteriorating influences of modern life can be diminished and a great contribution be made not only to longevity but also to efficiency and happiness.

The method of treatment of diseases at Saratoga Springs, made possible by the installations of the State for the utilization of the healing waters, and perfected by the co-operation of local physicians in adapting to the individual applicant the use of mineral waters internally and externally, consists of a system including without exception diet, exercise, rest, diversion and mineral water, internally or externally, according to the necessities of the individual as determined by an exhaustive examination. The work of the State here is a matter of life preservation and life extension. In the cases suitable for treatment with our waters, deteriorating influences are curbed, poisons are eliminated from the system and their production is prevented, impaired function is largely restored, and the patient who must return to an environment that does not admit, in many cases, of any change, is fortified with new habits of living and a new lease of life, so that his efficiency and his longevity are increased.

To meet a need growing with startling rapidity your Commission very wisely placed more emphasis upon the Saraghtoghie Bath (our Nauheim style of bath) for certain heart, arterial and incipient kidney diseases, using our natural mineral water with much success during the past season, in the cases sent to us for this variety of treatment. It was important to provide such facilities as were possible for this use of our waters, as far as your limited funds permitted, while awaiting an appropriation for the construction of the elaborate State Bath House, which the Commonwealth must without question eventually erect. The

little High Rock Bath House, meagre, and very plain, which your predecessors acquired with the property that included the neighboring springs, serves its modest and very limited purposes as far as possible. The Lincoln Bath House, consisting of the renovated and well equipped old Lincoln Spring House, made adequate provision at an inconvenient point somewhat remote from town, for the excellent work that was accomplished there through the help of experienced and skilled bath superintendent and attendants. Facilities were provided by private enterprise and a jitney bus was run through the town and to the Lincoln Bath House several times daily. The planting of trees and flowering perennials improved the somewhat crude appearance of the surroundings, and the outdoor swimming pools, eagerly frequented by the young people, served to attract and perhaps to anchor families that might not otherwise have come to this point for treatment. The purchase of the Levengston Bath House on Phila street, the Kayaderosseras Baths, which occured so late in the season that the extensive changes, improvements and installations could not be completed until the first week in August, was wise, and furnished at once facilities necessary to meet the initial demand of 1915.

An essential point in connection with our bath houses is to have at hand without delay a larger quantity of mineral water than can be delivered to the bath houses directly from the respective springs.

The Lincoln Bath House was supplied by the Lincoln and Pierian Springs, both containing a high supersaturation of carbonic acid gas, and sufficient for the needs of the applicants last season. Next season, expecting a reasonable increase, these wells will be overtaxed and unless the bath day be restricted to a few hours, the supply will be insufficient, if reliance be placed upon pumping during the day.

The Hathorn No. 1 Spring water, which is conducted from the spring in the Hathorn Building, where part of it flows in a bowl, to the Bath House one block distant, will not afford, without pumping, sufficient water to supply the needs of all the bath tubs in the house should they be in use at once through increased patronage. It is, therefore, essential that an arrangement be

made at the earliest possible date for storage under pressure of a high grade of mineral water, which may be collected during the night and be in readiness to be conducted into the Lincoln and Kayaderosseras Bath Houses during the day, affording an abundant supply, if the bath day be lengthened by giving very early and very late treatments, as is desirable and may become absolutely necessary.

Provision should be made as promptly as possible for the administration of a small number of free baths and a very large number of baths at very low rates, in order that the farmer, the artisan and the mechanic, whose purses are not overfilled, may enjoy at the hands of the State the relief that the Commonwealth affords, and to which they are entitled. It must be repeated with emphasis that the water storage, one of the several necessary expenditures mentioned in the report of the Engineer, should be reckoned as of prime importance and be first considered.

Our attention must now be turned to the wide extension of our facilities for drinking our alkaline-laxative and alkaline-ferruginous waters. The small " Drink-Hall " was constituted by setting off a part of the Hathorn Spring Building, furnishing it with attractive and comfortable tables and chairs, as well as with a counter for the service of several mineral waters, and also a multiple drinking fountain at which the patient may help himself to either of three different spring waters. This hall was overtaxed during the summer, our records showing that during August 1,700 people a day entered through the pay entrance, while the vast number that frequented the portion of the building freely open to the public, was not enumerated but exceeded all previous gatherings of this nature. It is simply a statement of plain fact that no such waters as the State has restored and is bottling can be found east of the Rocky Mountains, and, therefore, it is the part of wisdom to provide, as early as possible, an ample, comfortable " Drink-Hall " equipped with ample means for utilization of these waters by drinking in order that a large number may be early benefited, and that the income to the State may be as prompt and as large as possible.

Vast numbers of persons who cannot be considered actually ill, but who, being generous diners of sedentary habits, suffering from

loss of vigor and probably "torpid liver," may secure relief by taking a definite course of drinking the water which is especially suited to their needs, neutralizing such acidity as is present in their tissues, securing the elimination of toxins that have formed, at the same time that they are pursuing a course of proper diet, out-of-door exercise, regular hours for sleeping and baths, if prescribed in addition by their physicians.

Many others are suffering from ailments which are commonly benefited by sodium chlorid waters, such as rhinitis and pharyngitis; the conditions loosely called catarrh of the stomach, and catarrh of the duodenum; intestinal stasis, with the accompanying toxaemia called "auto-intoxication"; the nutritional disease of joint cartilage denominated arthritis; and lithiasis, which is a systematic condition due to tardy or incomplete transformation and excretion of acid products. The presence in some of our drinking waters of considerable proportions of lithium chloride, in large dilution, renders them additionally useful, for this salt thus administered is diuretic, even if we deny the former claim that it is a uric acid solvent. At all events, our alkaline-saline waters are useful in gout and to prevent gout, and to aid in expelling urinary concretions, for such is the long experience of Dr. E. Heinrich Kisch of Prague and Marienbad, with waters of the same class. Our water is prescribed hot, warm or cold, or sometimes mixed with milk, according to the individual's needs, generally a half hour before breakfast, and in quantity six to forty ounces a day. Accurate dosage and exact use with regard to the meal or meals should be demanded of the patient. It may be well to add that much larger facility for serving hot mineral waters is imperatively needed and the small cost of this additional installation should be early considered.

The classification of our waters into alkaline-laxative, alkaline-saline, alkaline-ferruginous, and table waters remains as set forth in the small separate pamphlet published, though there is a variation in proportions of mineral constituents from time to time. This we must deem natural, when we consider that new secondary pores and solution channels are formed in the rocks by the erosive water, which decomposes and brings to the surface such soluble mineral deposits as it encounters.

The chemical analysis of the product of the Experimental Well is most interesting, since it testifies that this new water contains no chloride of sodium, and that much more than half its dissolved constituents consist of bicarbonate of sodium. This water bears an analogy to the water of the celebrated Grande Grille, of Vichy, France, the most famous and most used Vichy water except in this country. Here the product of the three Vichy spring known as Célestins are widely marketed and better known.

A small table showing the hypothetical combinations of the ingredients of the two waters affords easy consideration of this interesting and valuable new Saratoga water.

Chemical combinations in milligrams per litre	Saratoga Experimental	Vichy Grande Grille
Ammonium chlorid	26.75	none
Lithium chlorid	2.82	none
Potassium chlorid	161.15	none
Sodium chlorid	none	534.
Potassium bromid	16.00	none
Potassium Iodid	3.00	none
Sodium sulphate	trace	291.
Sodium metaborate	trace	trace
Sodium nitrate	trace	none
Sodium nitrite	trace	none
Sodium bicarbonate	3979.62	4883.
Potassium bicarbonate	1.48	352.
Calcium bicarbonate	1070.40	434.
Barium bicarbonate	4.28	none
Strontium bicarbonate	trace	3.
Ferrous bicarbonate	333.85	4.
Magnesium bicarbonate	826.34	333.
Ferric oxid and alumina	211.20	....
Sodium phosphate	....	130.
Sodium arseniate	....	2.
Silica	32.00	70.
Total	6533.29	7036.

It is earnestly hoped that further examinations of the Experimental Well will prove that the spring may be easily pumped and that the flow will be considerable; for its water will be of extreme value as a veritable alkaline in dyspepsia, joint disorders, acid diathesis, derangements of the urinary bladder and inflammatory deposits of certain kinds.

Saratoga Reservation Exhibit at the 1915 State Fair, Syracuse, N. Y.

Inquiries that have already been received, together with information obtained from physicians who had patients under treatment during the past Summer, lead us to expect a largely increased bath clientèle, and render absolutely necessary the early construction of a concrete reservoir for the storage of mineral water, designed by the Engineer and already mentioned in an earlier part of this report. Another construction of immediate necessity comprises the enlargement of the Lincoln Bath House to extend the wing used for male patients and provide increased facilities and more rest room accommodation, as well as a porch for the accommodation of visitors and those awaiting patients under treatment, which I have suggested shall be built across the driveway from the entrance to the bath house and connected by a sheltering roof.

An exhibit was arranged for the Panama-Pacific Exposition, covering a small part of the space previously assigned to the State Museum for geologic specimens and really forming a part of the extended and valuable display made by Dr. John M. Clarke, Director of the Museum and State Geologist. Owing to the very small amount of money which the New York State Panama-Pacific Exhibition Commission felt it could apportion to us, a very modest presentation was made, but preparations were ample for the distribution of several thousand copies of annual reports and other literature by means of which method wide publicity was given to the work of the State in this Reservation. Our exhibit at the Syracuse State Fair, lasting one week in September, was a repetition of the one made last year, occupying the same space and attracting as wide and favorable notice as then.

Close relations have been maintained with the members of the Saratoga Springs Medical Society, who have been considered as forming a Board of consulting physicians, in many respects, for all developments of medical features have been discussed with them. In 1898, Drs. Hermann and F. Parks Weber wrote, in their work, *Mineral Waters and Health Resorts of Europe*, as follows: "The knowledge, capability, and energy of the local medical men contribute largely to the success of Spa treatment, and this factor must always be taken into consideration when seeking a Spa for patients." With the exception of a few whose

practice is largely or entirely surgical, deep interest and devotion have been the prominent attributes of the majority of the local physicians.

Dr. James H. Honan, who has practiced at Bad-Nauheim for many years, acceded to the request of your Director, and delivered two lectures in Saratoga Springs upon the use of alkaline-saline waters externally. As a result of a movement begun nearly two years ago the annual meeting of the Medical Society of the State of New York will be held in Saratoga Springs on May 15-18, 1916, upon which occasion a representative body of physicians from all parts of the State will be present and will examine into the work of the Commonwealth here, in restoring the mineral waters and providing for their utilization.

Your Director has delivered a variety of addresses at the following towns upon the restoration of the waters and the State's conservation work here, at times including the geology and chemistry of the matter, at times emphasizing features that combine to render Saratoga Springs a desirable and attractive health resort, with the healing waters as its basis and center of therapeutic attraction: Scranton and Philadelphia, Penn.; Fortress Monroe, Va.; Hartford, Conn.; Westfield, Mass.; Troy, Schenectady, Saranac Lake and New York, N. Y., as well as at Saratoga Springs before mixed audiences of adults, students at the Skidmore School, who are largely nonresidents, and four hundred grammar school students residing in our city.

Materials for some periodicals have been furnished to various magazines, notably *Travel,* and to the sections of general information published as part of various Sunday newspapers. Articles written specially for the publications mentioned have been contributed by your Director to the *International Year Book* and the *New International Encyclopedia,* the *Bulletin* of the Merchants' Association of New York City, the *Real Estate Magazine, The Modern Hospital, The Medical Pickwick,* etc. Reading notices concerning the springs have been inserted by him, without cost to the Commission, in over twenty medical periodicals during the year, besides articles in local newspapers here and in Albany, for the purpose of informing visitors and those from whom visitors seek knowledge of the springs and their uses.

Pamphlets of information regarding the State waters for drinking and bathing have been distributed to all physicians registered in the principal cities of Cuba; in Bahia, Rio de Janeiro, Santos and Sao Paulo, Brazil; in Antofagasta, Conception, Santiago and Valparaiso, Chile; in Columbia, Bogota; in Arequipa and Lima, Peru; in Montevideo, Urugnay; and in Buenos Aires, Argentina; translations into Spanish and Portuguese having been made for this purpose. A small German edition was distributed in and about New York City. Over 30,000 pamphlets in English, of which copies are appended, have been sent to as many physicians in various States and many thousands of pamphlets and reports were distributed at San Francisco, during the Panama-Pacific Exposition. This publicity will be of very great advantage, and its influence will be productive during four or five years to come, to judge by the experience of large advertisers.

The State's benevolent yet lucrative enterprise, launched so carefully and wisely, has progressed in the main satisfactorily though slowly, from the medical point of view. A notable step has been taken by the Commonwealth under your guidance, toward putting within reach of many invalids the remedial agencies of "the waters under the earth."

Respectfully submitted,

ALBERT WARREN FERRIS,

Superintending Director.

December 22, 1915.

SUPPLEMENT TO THE STUDY OF THE HYDRAULICS OF THE MINERAL WATER SYSTEM AT SARATOGA SPRINGS

Published with the Commissioner's Report to the Legislature of 1915

By Charles C. Lester,

Counsel to the Commissioners of the State Reservation

In my previous study of the hydraulics of the mineral water system, I arrived at the conclusion that there existed in the Saratoga plateau a double hydraulic system; first, a superficial system of fresh ground waters in the porous sand and gravel of the heavy deposit of drift overlying the shale; and a second system at a much greater depth, moving in solution channels through the bedding planes of the Little Falls dolomite, in a general northeasterly direction, under the influence of an artesian head somewhat remote from the valley of the springs, where, under natural conditions prior to the drilling of artesian wells, the mineral waters flowed to the surface in natural springs.

During the month of June, 1915, an unusual rainfall at Saratoga raised the levels of the upper fresh water system to an unusual height; and, concurrently, the Congress Spring, at which a new artesian well had been sunk until it intercepted the mineral waters in the dolomite, began to manifest a greatly increased vigor and a much more copious flow. This was taken by very eminent authorities, whose opinion as to the scientific questions involved in the hydraulic problems should be received with the greatest consideration, to negative the theory of the existence of a double hydraulic system and to indicate such intimate relations between the fresh waters moving near the surface of the ground and the deeper mineral waters as to forbid the conception of two distinct systems.

Upon careful reflection, however, it seems to me that the facts observed do not militate against the theory I advanced, but on the contrary, are in complete harmony with it.

When the original Hathorn Spring No. 1 was tubed the last time, a large excavation was made at the fault line; and the joint

at the foot of the escarpment, where the rocks on the east side of the fault come into contact with those on the west side, was exposed. It was precisely at this line of junction, forty feet below the natural surface of the ground, that the mineral waters were found, issuing from crevices in the rock so narrow that a knife blade could hardly be inserted in them, but extending a considerable distance along the fault line — in fact as far as the joint was exposed. I went down into the excavation at that time and saw what I am now describing. There is no doubt in the minds of those familiar with the conditions that, if this excavation had been continued indefinitely along the fault line, a similar outflow of water would have been found for much of the distance, and in places where no springs had ever made their appearance at the surface.

A letter, written many years ago by the late Captain James P. Butler, described similar conditions which he had personally observed at a number of different springs he had visited and inspected, when they were being tubed and the fault line was exposed in a similar way.

From all these orifices, extending for a great distance along the fault line, there is doubtless a constant outflow of carbonated waters that mingle with the fresh waters, work upward and flow off to a greater or less extent in the superficial water courses. The flow from these orifices is retarded by the pressure of the superincumbent ground waters, to a greater or less degree, as the ground water levels in the valley rise and fall. During the lapse of great periods of time, a rather stable dynamical equilibrium has been reached between the forces which cause the outflow of the mineral waters from the dolomite and the back pressure of the upper ground waters, which tend to restrict the flow of the mineral waters and to prevent them from flowing out through these minute orifices from the dolomite strata. It is a matter of common observation that, whenever the back pressure of the upper ground waters is relieved anywhere along the fault line, the mineral waters flow out from these small orifices with much greater rapidity; and when, as was formerly the case, great excavations were made for the purpose of tubing up the old springs from the foot of the escarpment to the level of the ground

and the inflowing waters from the surrounding soil were pumped out and the small fissures in the joint were exposed, a very great flow of mineral water resulted, to such a degree that it was with the utmost difficulty that the excavation could be kept clear of them by the men who were employed upon the work, and other mineral springs in the neighborhood were depleted. Under normal conditions, however, a very constant, though unknown quantity of mineral water is discharged above the surface of the rock, due to the difference in the force impelling the waters to flow out and the back pressure of the upper ground waters tending to restrain such flow, and the total outflow under normal conditions may be much greater than the aggregate of all the observed and measured flows of the known springs. It is probably due to this fact that the fresh waters of the springs and water courses in the valley of the springs carry an unusual amount of chlorine, as Mr. Ant has discovered by a series of chlorine tests upon the fresh waters in Congress Park.

The force impelling the flow is, of course, the mineral water head, wherever it may be, at a greater or less distance from the point of outflow, diminished by the loss through friction experienced by the mineral waters in flowing through the rocky strata. With every increase in the rapidity of the movement, the loss by friction increases, the tendency upon any change of conditions being toward a new condition of equilibrium.

Assuming, now, the existence of an artesian system and an outflow provided by nature at the fault line for the mineral waters, forty feet below the surface of the ground and thirty feet below the ground water table, what result ought we to anticipate from a rise of the ground water levels and an increase of the back pressure at all the points of mineral water outflow along the fault line? Manifestly, the following: First, with the increase in the resistance of the ground water pressure at the fault line to the outflow of mineral waters from the dolomite, a consequent retardation of their flow; second, a diminution of the loss of head by friction and consequent increase of head at the points of outflow, concurrent with the diminished velocity of flow; third, an increased head or pressure of the mineral waters not only at the points of natural outflow but at all points in the artesian system near it.

If, under such conditions, we have a direct outlet from the mineral water strata to the surface of the ground, such as the tube of an artesian well, so arranged that the flow therefrom is not retarded by the rise in the surrounding ground water levels, we should naturally expect to realize an increased flow of mineral waters at such an outlet due to the increase in the mineral water head or pressure at the bottom of the artesian well, resulting in the manner I have described.

It may be easier to understand the operation of these forces by imagining an artificial system of pipes fed by a constant head such as is common in municipal water systems supplied by gravity. If we take a water main of considerable length, terminating in a group of supply pipes and in faucets which are open, we shall have a constant flow from all the faucets; but, if we take measures to restrict the flow from all but one of them, so as to check the velocity with which the water goes through the main, we shall immediately experience an increase of flow from the faucet whose condition remains unchanged; and, if all the faucets save one be hermetically sealed, and the main be of adequate size, the entire head due to gravity, without any appreciable loss from friction, will be experienced at the one open faucet, and the amount of water flowing from it may be enormously increased.

So it happens that, when the ground water levels in the valley of the springs rise under the influence of melting snows in the spring, or heavy rains in the summer and the outflow from the natural orifices is retarded and the whole mineral water stream sets back upon itself, the rapidity of its flow and consequent loss of head from friction is diminished and a greater pressure is experienced at every point in the system.

In the case of such an artificial outlet as that which has been provided for the Congress Spring, at the bottom of a bowl or depression from which other ground waters are excluded and therefore unable to exercise a back pressure on the mineral water stream flowing out of the well and unable in this way to retard its movement, when the pressure that causes the flow is increased in the manner I have described the flow of the mineral water will necessarily be increased, also. Such an increased flow, under such conditions, does not contradict the theory of a double hydraulic system, but is in complete harmony with it.

Result of Drilling an Experimental Well

Following out the recommendations which I made to the Board in the summer of 1914, a tract of land was acquired about 1,000 feet southwesterly from the Hathorn Spring No. 2, from which direction it seemed to me probable the waters were flowing toward the wells and springs of the Reservation; and the following fall the drilling of a well on this property was begun for purposes of experiment and observation. The altitude of the mouth of the well is 23.20 feet higher than that of Hathorn No. 2. It was drilled to a depth of 420 feet, passed through a heavy deposit of drift, penetrated the Hudson river shales and terminated in a limestone formation. After entering the shale, the well was nearly dry until it reached a considerable depth below the surface, when the water came in. The water level in this well is twenty-two feet higher than the water level in Hathorn No. 2 and this fact is very cogent in compelling the belief that the movement of ground waters between these two points must be in a northeasterly direction, which is quite in harmony with our previous conclusions.

After penetrating the shale, a strong odor of sulphuretted hydogen and hydro-carbon gases became apparent, and when a vessel was filled with the thick mud brought up by the sand bucket, the mass exhibited a curious behaviour, rising and flowing over the edges of the vessel like batter until a large collection of gas that had been forming in the interior of the mass came to the surface and passed off suddenly into the atmosphere in a puff. The contents of the vessel then seemed to collapse and sink to about two-thirds of their original volume. The mass would then remain quiescent, unless shaken or agitated with some violence, when the process of rising, overflowing and collapsing would be repeated, with a further loss of volume.

The gases thus given off smelled strongly of sulphuretted hydogen and were evidently soluble in water, but their accurate determination was impossible, as the laboratory of the State Reservation was without the appliances necessary for their chemical analysis.

Lack of funds required the Commissioners to discontinue work upon the well after it had reached a total depth of 420 feet. At this point it seems evident that the well had not yet reached the

dolomite strata in which the normal mineral water channels are found. It was thoroughly sandbucketed and pumped until the residuum of broken and pulverized rock resulting from the drilling was removed, and a sample of water was then secured for analysis.

Further Indications as to Origin of Sodium Bicarbonate

The result of this analysis was remarkable, showing a highly mineralized water, quite devoid of chloride of sodium, but carrying a very large amount of sodium bicarbonate. The chloride of sodium has been thought to be the fundamentally characteristic salt of the Saratoga waters derived with the carbon dioxide from volcanic sources. In my previous study of the hydraulics, the results of which were published in the Commissioner's report for 1915, I suggested that the sodium bicarbonate might be the result of local chemical reactions which changed a portion of the sodium chloride to sodium bicarbonate. This suggestion seems to receive confirmation from the extraordinary chemical character of the water of the experimental well, in which the normal sodium chloride content seems to have been wholly transformed into sodium bicarbonate.

Mr. Ant, who is in charge of the chemical department of the Reservation, greatly confirms the probability of such a reaction, since we are at liberty to assume the presence in the shale of the sulphuric acid radicle and marsh gas (CH_4). Mr. Ant has furnished me with the following possible, if not probable, reactions by which the sodium chloride, first changed into sodium sulphate, might then be converted into sodium bicarbonate:

$$Na_2SO_4+2\ CH_4=Na_2S+2\ CO_2+8\ H$$
$$Na_2S+CO_2+H_2O=Na_2CO_3+H_2S$$

In this way, it seems to me, the suggestion of the manner in which the sodium bicarbonate originates is removed from the sphere of mere speculation.

In this connection it seems to me significant that, if we reconvert the bicarbonate of sodium content of the waters of the new well into chloride of sodium, we shall have a chlorine content

which bears about the same relation to the carbonates of lime and magnesia as is found in the waters of Hathorn Spring No. 2, the nearest of the Saratoga springs or wells to the experimental well we are describing. It seems reasonable to suppose that the waters from which the latter well is now deriving its supply are considerably above the main channel in the bedding planes of the Little Falls dolomite, through which the mineral waters are moving from their sources to the artificial openings afforded by the artesian wells and the natural openings created by the Saratoga fault, and have long stood in contact with the waters percolating downward through the shale, carrying with them the efficient re-agents that have effected the metamorphosis of the chloride of sodium content into sodium bicarbonate.

Additional illuminating facts might be secured by increasing the depth of the new well and penetrating the dolomite strata, through which experience has shown that the mineral waters find their principal channels and where, if they should be encountered by deepening this well, they might be found carrying their normal content of chloride of sodium and but a small quantity of sodium bicarbonate.

Further Indications as to Direction of Flow

If we go a step further and pursue the same course in our comparison of the proportion between the total chlorine content and the total content of the bicarbonates of the alkaline earths in each of the different springs and wells by regarding the sodium bicarbonate as representing part of the original sodium chloride content, we shall get a new table of percentages with which to replace the table found on page 87 of the last report, as follows:

Hathorn No. 2	55.8 per cent.
Orenda	68.3 per cent.
Lincoln	76.6 per cent.
Hathorn No. 1	82.7 per cent.
Emperor	106.2 per cent.
Old Red	172.4 per cent.

This table better satisfies the requirements of the theory that, as the waters move northeasterly in the dolomite strata, the ratio

of the bicarbonates of lime and magnesia to the soluble chlorides contained in the water constantly increases. It shows a progression that accords better with the distances traversed and avoids the extreme results observed after entering the valley of the springs.

But the accumulation of exact data in regard to hydraulic conditions has progressed to such a degree that we have now the most important and decisive information requisite for the determination, beyond reasonable doubt, of the direction of the flow of the mineral waters in a series of the water levels in different wells, from the Experimental Well, to which reference has been made, at the southwest extremity of the Reservation, to the Emperor Spring, at its northeasterly extremity. These water levels, stated in elevation above sea level, are as follows:

Name of Well	Water level
Smith Experimental	289.1
Hathorn No. 2	269.8
Coesa	260.9
Orenda	282
Lincoln	277.9
Hathorn No. 1	267.3
Emperor	262

The foregoing shows a uniform decline in the height of the water levels from the Smith well to the Emperor Spring, except in the case of the Hathorn No. 2 and the Coesa, the levels of which seem to be below that which should be expected in view of their situation, and this may be accounted for by their proximity to the Coesa valley, in which are several wells at a much lower level, the flow of mineral waters from which is very copious. It seems to me not improbable that the copious flow from these wells at low levels may result in a depletion of the entire system in their neighborhood, the effect of which is apparent in the low water levels of Hathorn No. 2 and Coesa. These figures indicate to my mind, with irresistible force, the correctness of the theory that the mineral waters move in the dolomite strata where they are encountered in a general northeasterly direction between the Experimental well and the Emperor Spring, a distance of more than three miles.

Significance of Last Analysis of the Lincoln Spring

In my previous paper, at page 86 of the Report of the Commissioners for 1915, will be found a table in which the wells are stated in their order from southwest to northeast, and the names of the different springs or wells are given, with the content of soluble chlorides in the waters of each, expressed in parts per million.

I then called attention to the apparent failure of the Lincoln Spring to conform to the rule of a general progressive diminution of the chlorine content, arising, as I supposed, from continued dilution from fresh waters percolating into the dolomite strata and mingling with the mineral waters; and I accounted for this want of conformity by the fact that the analyses of the Lincoln Spring was made many years before the analysis of the other springs, with which comparison was then made, and before the depletion to which all the springs were afterward subjected as to their mineral content, as well as their hydraulic head, by the pumping of the carbonic gas companies; and I suggested that an analysis made at the present time would probably place the Lincoln Spring between the Adams and Hathorn No. 1.

Since then, a new analysis of the waters of the Lincoln Spring has been made by Mr. Ant. These waters were secured on the 18th of September last, after the well had been pumped for more than two months to supply the Lincoln Baths, and showed a content of soluble chlorides amounting to 3639.42 parts per million, placing the Lincoln Spring in conformity with the general rule with which it did not seem at the time my former paper was written to accord.

The whole subject of the genesis and hydrology of the Saratoga waters is not only of surpassing interest but of great practical importance, as pointing the way to proper methods of protection. At the High Rock Spring, we have now, by the installation of the pit from which the water supply for the High Rock Baths is taken, and another excavation extending only to a sufficient depth to encounter the local ground waters, demonstrated a difference between the fresh water head and the mineral water head, and that the mineral water head is the greater and is subject to fluctuations revealing its sympathy with forces that do not seem

to act upon the ground water table in that locality. I believe it to be most desirable to prosecute, persistently and systematically, all practicable observations upon the ground water levels as well as observations upon the temperature of the waters and other physical facts as opportunity may render them possible and further knowledge and experience may dictate.

DISBURSEMENTS

CHAPTER 239, LAWS OF 1913

Balance, January 1, 1915 (per last report)				$78,278 66
1915.				
Feb.	11. Edward W. Kearney and Emma K. Docharty, for United States and Pavilion Springs		$5,150 00	
	Interest on above		219 73	
	C. C. Lester, legal services in connection with above		336 10	
				5,705 83
				$72,572 83

CHAPTER 728, LAWS OF 1915

(Reappropriation of balance from Chapter 239, Laws of 1913.)

Balance, Feb. 11, 1915 (reappropriated)				$72,572 83
1915.				
July	13. Harry L. Levengston, Saratoga Baths		$60,000 00	
	Harry L. Levengston, interest on above		820 00	
	14. Ida E. Traver, et al., property		4,000 00	
	Ida E. Traver, et al., interest on above		102 00	
	15. Wilna N. Bishop, property		120 00	
	First National Bank of Saratoga Springs, property		1,500 00	
	Minerva L. Rickard, property		1,100 00	
	Minerva L. Rickard, interest on above		61 23	
	27. C. S. & C. C. Lester, legal services		1,335 50	
	(a) Levengston property	$439 50		
	(b) Ida E. Traver, property	521 00		
	(c) First National Bank of Saratoga Springs	206 80		
	(d) Minerva L. Rickard, property	151 60		
	(e) Wilna N. Bishop, property	16 60		
		$1,335 50		
Sept.	28. C. S. & C. C. Lester for legal services in connection with acquisitions, Dec. 1, 1914, to May 1, 1915		1,000 00	
				70,038 73
	Balance, October 1, 1915			$2,534 10

CHAPTER 335, LAWS OF 1915

Appropriation	$99,000 00

(To be applied in payment for properties already acquired.)

CHAPTER 252, LAWS OF 1914

General Expenses and Land Acquisitions

Balance, Jan. 21, 1915, per last report			$158,083 06
1915.			
Feb.	4. Stenstrom, Oscar R., services	$77 50	
	Lester, Charles C., legal services	750 00	
	5. Payroll, Jan. 1–15, office and field force	759 55	
	Payroll, Jan. 1–15, laborers	258 95	
	8. Payroll, Jan. 16–30, office and field force	891 95	
	Payroll, Jan. 16–30, laborers	252 11	
	19. Adriance Machine Works, Inc., supplies	335 00	
	Ainsworth, Geo. W., improvements	309 04	
	Anthony, Chas. G., services	324 00	
	Anthony, Chas. G., travel	18 95	
	Ballston Spa Garage, trucking	29 20	
	Ballston Spa Garage, supplies	18 13	
	Barclay, Frank D., travel	1 90	
	Bausch & Lomb Optical Co., supplies	6 00	
	Blackmer, G. F. & Son, Inc., supplies	9 50	
	Bond Bottle Sealing Co., supplies	310 93	
	Brownell, F. W., trucking	5 00	
	Brunner, Bernard, supplies	28 71	
	Collins, C. M., supplies	3 00	
	Crocker, Harry, improvements	259 51	
	Crocker, Harry, construction	335 38	
	Delaware & Hudson Co., freight	36 70	
	Ermold Edward Co., supplies	47 50	
	Elmore, C. B. travel	2 70	
	Farmer's Hardware Co., supplies	2 80	
	Ferris, Albert Warren, M. D., expert services	833 33	
	Fitzgerald, Jas. P., improvements	2,125 80	
	Goulds Mfg. Co., supplies	440 50	
	Hamm's Garage, supplies	22 65	
	Hartwell & Shackelford, insurance	1 13	
	Hoyt Bros. & Co., supplies	6 00	
	Independent Coal Co., supplies	95 00	
	International Steam Pump Co., supplies	20 00	
	Kewanee Private Utilities Co., supplies	384 30	

1915.			
Feb.	19.	Knapp, A. P., Agt., insurance	$90 00
		Lundgren, Carl J., supplies	4 75
		McNulty, James D., insurance	47 30
		Meader, A. H. & Son, supplies	4 00
		Montanye, G. N. & Son, supplies	2 00
		Muldowney, J. H., supplies	47 55
		National Express Co., expressage	12 88
		Noland, L. W., travel	17 49
		Peabody, George Foster, travel	23 10
		Postal Telegraph-Cable Co., telegrams	4 65
		Peabody, George Foster, office expenses	74 65
		Robson & Adee, supplies	2 00
		Ryall, James A., supplies	4 60
		Saratoga Coal Co., supplies	27 05
		Schallehn, T. C., supplies	5 47
		Settle, H. B., photographs	56 05
		Shevlin, Geo. F., Mfg. Co., supplies	22 27
		Sherin & Son, improvements	33 13
		Tarrant, Wm. P., improvements	156 97
		Towne-Roblee Hardware Co. supplies	24 94
		Underwood Typewriter Co., supplies	106 06
		Wells Pharmacy, supplies	2 81
		Western Union Telegraph Co., telegrams	6 90
		Winship, Geo. W., improvements	93 38
		Yawman & Erbe Mfg. Co., supplies	14 30
		Payroll, Feb. 1–15, office and field force	839 00
		Payroll, Feb. 1–15, laborers	120 23
March	3.	Payroll, Feb. 16–27, laborers	91 62
	10.	Payroll, Feb. 16–27, office and field force	664 06
	16.	Adirondack Electric Power Corporation, electricity	74 26
		Anthony, Chas. G., services	292 50
		Anthony, Chas. G., travel	59 05
		The Blake & Knowles Steam Pump Co., supplies	241 89
		Brunner, Bernard, supplies	5 42
		Capitol Roman Stone Co., improvements	173 05
		Capitol Roman Stone Co., advertising	57 00
		Crocker, Harry, improvements	857 18
		Delaware & Hudson Co., freight	19 49
		Eddy, Daniel & Sons, supplies	1 44
		Eimer & Amend, supplies	3 76
		Ferris, Albert Warren, M. D., expert services	833 33

1915.

March 16.	Ferris, Albert Warren, M. D., travel.	$57 75
	Farmer's Hardware Co., supplies....	4 35
	Gaffney, B. & Sons, construction....	370 05
	Hall, Charles E., travel.....	2 70
	Hartwell & Shackelford, insurance..	33 73
	Heslin's Garage, supplies.....	14 25
	Independent Coal Co., supplies.....	96 75
	Ingham, White & Co., insurance....	3 18
	Kendrick, Willis Jason, Inc., supplies	164 00
	Keystone Driller Co., supplies.....	37 84
	Lesan, H. E., Advertising Agency, advertising	89 99
	Mott, Samuel J., maps.....	1 62
	McNeary, Fred G., insurance.....	98 00
	N. Y. Telephone Co., telephone.....	16 80
	N. Y. Telephone Co., telephone.....	14 97
	The N. Y. World, advertising.....	192 80
	The N. Y. Continental Jewell Filter Co., supplies	40 11
	The N. Y. Times Co., advertising....	30 00
	National Express Co., expressage....	6 02
	Noland, L. W., travel.....	3 18
	Peterson, John, maps.....	200 00
	Peabody, George Foster, office expenses	24 24
	Postal Telegraph-Cable Co., telegrams	3 12
	Rattigan, C. F., Agent and Warden, furniture and fixtures.....	7 00
	Saratoga Coal Co., supplies.....	52 50
	The Saratogian, supplies.....	7 12
	Sherin & Son, supplies.....	50 44
	The Sun Printing Co., advertising...	20 00
	Settle, H. B., supplies.....	6 00
	Stenstrom, Oscar R., services.....	182 50
	Stenstrom, Oscar R., services.....	182 00
	Stone & Morris, travel.....	6 00
	Tarrant Mfg. Co., improvements.....	5 25
	Toch Bros., supplies.....	16 50
	Towne-Roblee Hardware Co., supplies	3 28
	Tarrant, Wm. P., improvements.....	194 71
	Van Voast & Leonard, insurance.....	9 00
	Western Union Telegraph Co., telegrams	3 18
	Ryall, James A., improvements.....	226 16
18.	Payroll, March 1–15, laborers.....	212 63
	Payroll, March 1–15, office and field force	622 23
Feb. 24.	Williams, Frank N., State Engineer and Surveyor, surveys.....	104 73

1915.

April	5.	Payroll, March 16–31, laborers	$689 24
		Payroll, March 16–31, office and field force	646 63
	20.	Payroll, April 1–15, laborers	1,010 79
	22.	Payroll, April 1–15, office and field force	683 25
May	7.	Payroll, April 16–30, office and field force	749 80
		Payroll, April 16–30, laborers	2,503 27
	12.	Anthony, Chas G., services	328 50
		Anthony, Chas. G., travel	77 68
		Ant, Herbert, travel	1 90
		Ackroyd, James & Sons, supplies	90 00
		Barclay, Frank D., travel	2 10
		Badger, E. B. & Sons Co., supplies	800 00
		Bradley, M. D., Jr., trucking	100 00
		Boston & Maine R. R., freight	17 97
		Brassler, Chas. A., special services	12 60
		Crocker, Harry, supplies and improvements	289 89
		The Delaware & Hudson Co., freight	186 53
		Eimer & Amend, supplies	17 83
		Elmore, C. B., travel	5 30
		Ferris, Albert Warren, M. D., expert services	833 33
		Ferris, Albert Warren, M. D., travel	80 69
		Gaffney, B. & Sons, construction	384 48
		Hodges, J. C., supplies	19 50
		Havens, J. T., supplies	200 00
		Kiewert, Chas. L. Co., supplies	1,825 00
		Lesan, H. E., Advertising Agency, advertising	139 33
		Noland, L. W., travel	2 57
		National Express Co., express	8 07
		N. Y. Telephone Co., telephone	22 70
		Ouderkirk & Paine, construction	120 58
		Peterson, John, services	67 62
		Peterson, John, travel	6 00
		Peabody, George Foster, office expenses	100 74
		Peabody, George Foster, travel	10 12
		Postal Telegraph-Cable Co., telegrams	22 77
		Ryall, Jas. A., construction	378 95
		The Saratogian, advertising	13 75
		Settle, H. B., photographs	5 50
		Schallehn, T. C., supplies	20 63
		Saratoga Coal Co., supplies	20 00
		Stone & Morris, livery	14 00
		Smaldone, Tony, construction	19 50

1915.

May	12.	Starbuck, E. D. & Co., supplies	$47 99
		The Sun Printing Co., supplies	2 00
		Tracy's, Thos. J., Son, construction	981 36
		Tarrant, Wm. P., supplies	158 91
		Western Union Telegraph Co., telegrams	3 05
		Ziegler, J. W., travel	1 70
	21.	Payroll, May 1–15, laborers	2,514 77
	26.	Adirondack Electric Power Corporation, electricity	113 12
		Anthony, Chas. G., services	334 50
		Anthony, Chas. G., travel	44 80
		Ainsworth, Geo. W., improvements	274 07
		Brownell, F. W., improvements	240 00
		Bradley, M. D., Jr., trucking	100 00
		Blakiston's, P., Son & Co., supplies	5 00
		Ballston Spa Garage, supplies	18 50
		Boston & Maine R. R., freight	23 57
		Carey, Patrick, improvements	12 50
		The Delaware & Hudson Co., freight	160 40
		Eddy, Daniel & Sons, improvements	76 80
		Eaton, E. C., & Sons, trucking	22 50
		Eimer & Amend, supplies	61 56
		Elmore, C. B., travel	4 60
		Erickson, August, improvements	189 30
		Ferris, Albert Warren, M. D., expert services	833 33
		The Farmer's Hardware Co., supplies	83 03
		The Fairbanks Co., supplies	18 70
		Gaffney, B. & Sons, improvements	18 50
		Gailor, John, improvements	285 60
		Glidden Varnish Co., improvements	12 60
		The Gould's Mfg. Co., supplies	5 88
		Hammond, E., supplies	46 00
		Hungerford, U. T. Brass & Copper Co., supplies	1,512 96
		Hall, Chas. E., travel	3 40
		Independent Coal Co., supplies	159 00
		Indian Refining Co., supplies	3 50
		Ingham, White & Co., insurance	37 50
		Johnson, Gustav, improvements	88 50
		Knapp, A. P., insurance	44 00
		The Liquid Carbonic Co., supplies	1,460 00
		Lesan, H. E., Advertising Agency, advertising	71 66
		Lester, C. C., legal services	750 00
		Leader Iron Works, supplies	508 07
		Mangelsdorf, J., supplies	6 00
		Mott, J. L., Iron Works, supplies	3,171 05

1915.

May	26.	Montanye, G. N., & Son, supplies....	$2 00
		National Express Co., express.....	15 15
		N. Y. Telephone Co., telephone.....	18 45
		Noland, L. W., travel.....	4 62
		Penny, J. W., & Sons Co., supplies..	17 00
		Postal Telegraph-Cable Co., telegrams	10 54
		Peterson, John, services	100 00
		Page Woven Wire Fence Co., supplies.	166 50
		Paul, James, improvements.....	163 00
		Peabody, George Foster, office expenses	108 19
		Pettibone, Chas. G., improvements...	45 70
		Putnam Street Garage, supplies.....	16 55
		Ryall, James A., construction.....	1,080 19
		Robson & Adee, stationery supplies..	31 94
		Sherin & Son, improvements.....	229 28
		Shevlin, Geo. F., Mfg. Co., improvements	226 59
		Saratoga Coal Co., supplies.....	243 70
		Sheldon, J. S., insurance.....	26 25
		Snead & Co., Iron Works, supplies..	88 00
		Standard Oil Co. of N. Y., supplies..	47 00
		Stone & Morris, livery.....	8 00
		Stenstrom, Oscar R., services.....	313 25
		Tracy's, Thos. J., Son, improvements and supplies	1,269 54
		Tarrant, Wm. P., improvements.....	575 36
		Towne-Roblee Hardware Co., supplies	80 23
		Winship, Geo. W., improvements....	795 66
		Western Union Telegraph Co., telegrams	24 25
		Wiswall, Clara E., supplies.....	6 00
		Wilmarth & Son, supplies.....	980 00
	27.	Payroll, May 1–15, office and field force	763 31
June	8.	Payroll, May 16–30, laborers.....	1,617 47
	10.	Payroll, May 16–30, office and field force	831 19
	22.	Payroll, June 1–15, office and field force	951 12
	23.	Payroll, June 1–15, laborers.....	487 42
July	8.	Ant, Herbert, travel.....	3 50
		Anthony, Chas. G., services	324 00
		Anthony, Chas. G., travel	15 39
		Ainsworth, Geo. W., improvements..	904 91
		Adirondack Electric Power Corporation, supplies	6 41
		Black, Mrs. Alice, supplies.....	6 00
		Barclay, Frank D., travel.....	2 70

1915.			
July	8.	Barnett, Wm. H., trucking	$38 00
		Boston & Maine R. R., freight	9 01
		Brunner, Bernard, supplies	28 11
		Blackmer, G. F., & Son, supplies	13 01
		Brownell, F. W., supplies	100 00
		Chase Bros. Co., supplies	94 50
		Canton Steel Ceiling Co., improvements	350 47
		Capitol Roman Stone Co., improvements	258 70
		Crocker, Harry, supplies	86 30
		Crandall, S. J., supplies	129 50
		Delaware & Hudson Co., freight	195 96
		Dehn, Christian, supplies	65 10
		Eddy, Daniel, & Sons, Inc., supplies	13 63
		Eimer & Amend, supplies	20 03
		Emery, John W., supplies	18 00
		Ferris, Albert Warren, M. D., expert services	833 33
		Ferris, Albert Warren, M. D., travel	183 01
		The Farmer's Hardware Co., supplies	44 70
		Freeman & Shea, improvements	5 86
		Gailor, W. H., supplies	62 47
		The Goulds Mfg. Co., supplies	368 00
		Gailor, John, supplies	424 52
		Hungerford, U. T., Brass & Copper Co., supplies	3,065 16
		Hartwell & Shackelford, insurance	260 71
		Hall, L. O., supplies	31 70
		Ingham, White & Co., insurance	65 75
		Johnson, Gustav, supplies	96 00
		The Press Co., advertising	112 50
		Kendrick, Willis Jason, Inc., supplies	64 00
		Lyon, J. B., Co., printing and stationery	52 31
		Lesan, H. E., Advertising Agency, advertising	102 99
		Lundgren, Carl J., supplies	382 50
		McGibbon & Co., supplies	43 75
		Mott, Samuel J., supplies	32 89
		Mott, J. L., Iron Works, supplies	2,610 00
		The Master Builders Co., improvements	18 00
		McBride, Nast & Co., advertising	37 50
		The Montrose Nurseries, supplies	52 50
		Noland, L. W., travel	13 95
		Noland, L. W., office expenses	17 43
		The National Cash Register Co., supplies	237 50

1915.			
July	8. National Express Co., express	$33	62
	N. Y. Telephone Co., telephone	23	24
	Partridge, F. H., supplies	62	06
	Pratt & Lambert Co., improvements	26	00
	Postal Telegraph-Cable Co., telegrams	4	38
	Parmenter, Clarence R., improvements	237	49
	Paul, James, supplies	102	00
	Peterson, John, services	100	00
	Pitney, J. V., supplies	72	50
	Ryall, Jas. A., improvements	620	41
	Ross-Ketchum Co., supplies	6	15
	Rattigan, C. F., Agent and Warden, supplies	6	47
	Sherin & Son, improvements	86	93
	Shevlin, Geo. F., Mfg. Co., supplies	110	05
	Stone & Morris, travel	27	50
	Saratoga Coal Co., supplies	76	80
	Schallehn, T. C., supplies	39	12
	Smith, Phineas, supplies	27	24
	The Sun Printing Co., supplies and advertising	10	50
	Settle, H. B., photographs	159	40
	The Snead & Co. Iron Works, supplies	95	00
	Smith, W. & T Co., supplies	187	80
	Scientific Materials Co., supplies	48	50
	The Saratogian, supplies and advertising	62	70
	Tracy's Thos. J., Son, supplies and improvements	1,904	18
	Towne-Roblee Hardware Co., supplies	41	34
	Tarrant, Wm. P., improvements	1,811	34
	Tarrant Mfg. Co., improvements	6	50
	Thompson, R. H., improvements	32	00
	Trombly, John B., supplies	11	00
	Page Woven Wire Fence Co., supplies	28	86
	Underwood Typewriter Co., supplies	83	03
	U-Auto Varnish Sales Co., supplies	4	50
	Van Voast & Leonard, insurance	56	51
	Wilmarth & Son, supplies	735	25
	Winship, Geo. W., improvements	361	40
	Western Union Telegraph Co., telegrams	7	10
	Wykoff, A. & Son Co., supplies	10	63
	Waterbury, W. R. & Co., supplies	1	75
	Wells Pharmacy, supplies	10	40
	Keystone Driller Co., supplies	154	90
	Jones of Binghamton, supplies	15	62
	14. Payroll, June 16–30, laborers	1,044	78
	Payroll, June 16–30, office and field force	1,029	13

1915.

July	24.	Payroll, July 1–15, office and field force	$994 17
		Payroll, July 1–15, laborers	771 36
Aug.	5.	Anthony, Charles G., services	345 00
		Ackroyd, Jas. & Sons, supplies	130 00
		Ainsworth, Geo. W., improvements	16 01
		Bogart, A. B., photos	12 00
		Brownwell, F. W., supplies	81 00
		Brunner, Bernard, supplies	19 55
		Barnett, Wm. H., trucking	20 00
		Crocker, Harry, supplies	974 15
		Colgate & Co., supplies	14 00
		Crandall, S. J., supplies	72 00
		Capital Roman Stone Co., improvements	349 07
		Delaware & Hudson Co., freight	82 35
		Dunn, Thomas, improvements	1,574 80
		Edson Mfg. Co., supplies	2 38
		The N. K. Fairbank Co., supplies	2 92
		Ferris, Albert Warren, M. D., expert services	833 33
		Finch, Harry L., supplies	76 50
		Gailor, John, supplies	48 72
		Hammond, E., supplies	23 00
		Gaffney, B. & Sons, improvements	736 70
		Hall, Charles E., travel	3 90
		Handy, Frank H. supplies	18 01
		The High School Recorder, advertising	2 00
		Independent Coal Co., supplies	57 50
		Kewanee Private Utilities Co., supplies	520 24
		Ledlie, D. B. & Son, improvements	1,506 13
		Lackawanna Bridge Co., supplies	29 38
		Lester, C. C., legal services	750 00
		Mangelsdorf, J., supplies	15 60
		McNeary, John & Sons, travel	7 50
		Mott, J. L. Iron Works, supplies	117 00
		National Express Co., express	31 78
		N. Y. Telephone Co., telephone	21 98
		Noland, L. W., office expenses	166 06
		Noland, L. W., travel	23 07
		Oelschlaeger Bros., supplies	21 00
		Ouderkirk & Paine, improvements	500 47
		The Philadelphia County Medical Society, advertising	24 00
		Postal Telegraph-Cable Co., telegrams	1 94
		Page Woven Wire Fence Co., supplies	47 00
		Parmenter, Clarence R., improvements	143 70
		Pitney, J. V., supplies	355 00

1915.			
Aug.	5. Peterson, John, services	$100	00
	Ryall, Jas. A., improvements	865	07
	Ross-Ketchum Co., supplies	4	75
	Robertson, W. S., improvements	1,686	60
	Robson & Adee, supplies	3	40
	Romeike, Henry, advertising	12	00
	Rattigan, C. F., Agent & Warden, supplies	64	60
	Saratoga Coal Co., supplies	90	90
	Settle, H. B., photos	20	80
	Standard Oil Co. of N. Y., supplies	164	90
	Semet-Solway Co., supplies	73	50
	Shevlin, Geo. F., Mfg. Co., supplies	27	34
	Stenstrom, Alma, services	125	00
	Starbuck, E. D. & Co., supplies	36	52
	Tarrant, Wm. P., improvements	5,032	30
	Trombly, John B., Agent & Warden, supplies	175	00
	Towne-Roblee Hardware Co., supplies	13	22
	Tracy's Thos J., Son, improvements	1,265	61
	Worthington, Henry R., supplies	416	00
	Western Union Telegraph Co., telegrams	7	43
	Winship, Geo. W., improvements	643	68
	Wanamaker, John, supplies	104	85
	Wilkins, Floyd G., improvements	12	00
	Walker & Gibson, supplies	51	00
	Woolworth, F. W., & Co., supplies	3	10
	Wilmarth & Son, supplies	964	38
	Whitford, Chas. C., supplies	60	00
	6. Payroll, July 16–31, office and field force	1,071	31
	12. Payroll, July 16–31, laborers	925	63
	Payroll, July 16–31, bath attendants	30	66
	20. Payroll, Aug. 1–15, laborers	528	83
	24. Payroll, Aug. 1–15, office and field force	1,151	87
	28. Adirondack Electric Power Corporation, supplies	49	92
	Allen, Wm. & Co. Inc., supplies	9	50
	Anthony, Chas. G., services	375	00
	Anthony, Chas. G., expenses	2	10
	Ainsworth, Geo. W., improvements	86	64
	Beyer, J. A., supplies	39	74
	Baker, H. W., Linen Co., supplies	273	71
	Ballston Spa Garage, supplies	41	00
	Brunner, Bernard, supplies	17	48
	Blackmer, G. F. & Son, supplies	19	95
	Capital Roman Stone Co., improvements	314	10

1915.

Aug.	28.	Crocker, Harry, improvements	$539 83
		Collins, C. M., supplies	18 00
		Daggs, Emery, supplies	18 00
		Daggs, Emery, damages	30 00
		The Delaware & Hudson Co., freight	18 44
		Dennin, Hugh J., Mgr., special services	10 50
		Eddy, Daniel & Sons, supplies	63 96
		Ferris, Albert Warren, M. D., expert services	833 33
		Federal Printing Co., printing	19 05
		The Farmer's Hardware Co., supplies	156 92
		The Fairbanks Co., supplies	32 00
		Fairbanks, The N. K. Co., supplies	6 76
		Gailor, W. H., supplies	41 83
		General Electric Co., supplies	19 31
		Gailor, John, supplies	33 60
		Garant, Frank W., supplies	154 83
		Hodges, Charles R., advertising	40 00
		Hewitt, F. V. & Son, supplies	26 90
		Hartwell & Shackelford, insurance	32 66
		Independent Coal Co., supplies	23 75
		Ingham, White & Co., insurance	130 00
		Keuffel & Esser Co., supplies	5 02
		Leotaud, A. B., improvements	261 28
		Liquid Carbonic Co., improvements	44 84
		Lundgren, Carl J., improvements	160 78
		Lyon, J. B. Co., printing	200 53
		Leonard, J. E., supplies	5 58
		McNulty, James D., insurance	193 79
		N. Y. Telephone Co., telephone	29 60
		Ouderkirk & Paine, improvements	950 37
		Osborne, Thos. Mott, Agent & Warden, supplies	4 06
		Oelschlaeger Bros., supplies	21 00
		Page Woven Wire Fence Co., supplies	33 72
		Peterson, John, services	100 00
		Postal Telegraph-Cable Co., telegrams	3 01
		The R. U. V. Co., improvements	195 00
		Ryall, James A., improvements	364 18
		Rattigan, C. F., Agent & Warden, supplies	19 20
		Riker & Hegeman Co., supplies	25 98
		Roseborn, H. W., advertising	25 00
		Ritchie Bros., improvements	340 27
		The Reeves Reagan Paint Co., supplies	1,821 97
		Standard Oil Co. of N. Y., supplies	140 20
		The Saratogian, supplies	80 45
		Settle, H. B., photographs	33 00
		Shevlin, Geo. F., Mfg. Co., supplies	28 83

1915.			
Aug.	28.	Stenstrom, Oscar R., services	$250 00
		Stenstrom, Alma, services	250 00
		Snyder, W. S., improvements	478 40
		Sherin & Son, improvements	1,527 11
		Stone & Morris, travel	6 25
		Starbuck, E. D. & Co., supplies	64 73
		Saratoga Coal Co., supplies	37 10
		The Sun Printing Co., supplies	21 05
		Thomas, R., supplies	16 00
		Towne-Roblee Hardware Co., supplies	19 21
		Thompson Laundry The, supplies	83 73
		Tarrant Mfg. Co., supplies	130 23
		Tarrant, Wm. P., supplies	224 69
		Trombly, John B., Agent & Warden, supplies	202 00
		Trimount Press, Printing	41 50
		Woolworth Co., F. W., supplies	10 20
		Noland, L. W., office expenses	8 85
		Ledlie, Thos, R., supplies	38 52
		Tiemann, Geo. & Co., supplies	9 50
		Van Voast & Leonard, Insurance	156 25
		Van Benthuysen, Chas. & Sons, Inc., supplies	1 15
		Van Deusen, C. C., supplies	18 10
		Veeder & Brown, improvements	26 25
		Walker & Gibson, supplies	16 30
		Wallace, C. H., improvements	525 74
		Wilkins, Floyd G., supplies	35 10
		Wait, The F. W. Lime Co., supplies	18 75
		Williams, John, improvements	21 00
		Ledlie, D. B. & Son, improvements	56 87
		Walker, Elmer A., supplies	22 92
	30.	Kendrick, Willis Jason, Inc., supplies	529 20
Sept.	7.	Payroll, Aug. 16–31, laborers	394 94
	8.	Payroll, Aug. 16–31, office and field force	809 50
	21.	Payroll, Sept. 1–15, laborers	333 08
		Payroll, Sept. 1–15, office and field force	825 06
	22.	Anthony, Chas. G., service	346 50
		Anthony, Chas. G., travel	3 32
		Alberene Stone Company, improvements	440 00
		Adirondack Electric Power Corporation, electricity	98 79
		Baker, H. W. Linen Co., supplies	34 17
		Barber, Ira C., supplies	10 53
		Boston Belting Co., supplies	13 40
		Boston & Maine R. R., freight	3 37

1915.

Sept.	22.	Brunner, Bernard, supplies	$5 93
		Crawford, F. M., services	10 00
		Delaware & Hudson Co., freight	5 43
		Eagle Printing Co., advertising	30 00
		N. Y. Evening Post, advertising	200 00
		Fairbank, N. K. Co., supplies	6 75
		The Farmer's Hardware Co., supplies	13 40
		Gailor, W. H., improvements	85 38
		Garrettson, F. P. & Co., supplies	2 78
		Getman, A. J., improvements	361 58
		General Carbonic Co., supplies	10 00
		Godfrey, F. N., travel	129 51
		The Goulds Mfg. Co., supplies	16 74
		Hall, Chas. E., travel	2 00
		Hamm's Garage Co., Inc., supplies	10 10
		Handy, Frank H., supplies	2 47
		Hewitt, F. V. & Son, supplies	16 33
		Independent Coal Co., supplies	492 40
		Kendrick, Willis Jason, Inc., supplies	1 80
		Knickerbocker, J. E., supplies	2 50
		Ledlie, Thos. R., supplies	1 75
		Lietzky, H., supplies	8 50
		Lyon, J. B. Co., printing and stationery	52 50
		Malloy, Frank, supplies	6 43
		McNeary, John & Sons, livery	14 25
		Myers, John G. Co., supplies	25 00
		National Express Co., express	26 12
		N. Y. Telephone Co., Telephone	25 57
		Noland, L. W., travel	7 93
		Noland, L. W., office expenses	94 41
		Peabody, George Foster, travel	6 89
		Pitney, J. V., improvements	35 00
		The Press Co., advertising	3 80
		Putnam Street Garage, supplies	3 80
		Rattigan, C. F., Agent & Warden, supplies	4 42
		Robson & Adee, supplies	12 12
		Ritchie Bros., improvements	32 80
		The R. U. V. Co., supplies	12 75
		Ryall, James A., improvements	127 25
		City of Saratoga Springs, water taxes	89 69
		Saratoga Coal Co., supplies	127 06
		Saratoga Ice Co., supplies	9 69
		Starbuck, E. D. Co., supplies	38 94
		Tarrant Mfg. Co., improvements	19 40
		Thompson Laundry, The, supplies	162 81
		Towne-Roblee Hardware Co., supplies	6 72

1915.			
Sept. 22.	Trombly, John B., Agent & Warden, supplies	$84 50	
	Van Deusen, C. C., supplies	16 99	
	Walker & Gibson, supplies	35 56	
	Wells Pharmacy, supplies	2 20	
	Western Union Telegraph Co., telegrams	14 83	
	Wilkins, Floyd G., supplies	69 02	
	Williams, F. R., supplies	45 50	
	Williams, John, improvements	15 75	
	Winship, Geo. W., improvements	181 77	
	Worthington, Henry R., supplies	24 31	
	Cavanaugh, Mary, services	40 00	
	Ferris, Albert Warren, M. D., expert services	833 33	
	Stone & Morris, livery	20 00	
	The Sun Printing Co., printing	49 75	
	Beyer, J. A., supplies	39 39	
	Blackmer, G. F. & Son, Inc., supplies	9 25	
	National Bottlers' Gazette, advertising	7 00	
			$126,372 56
	Balance, October 1, 1915		$31,710 50

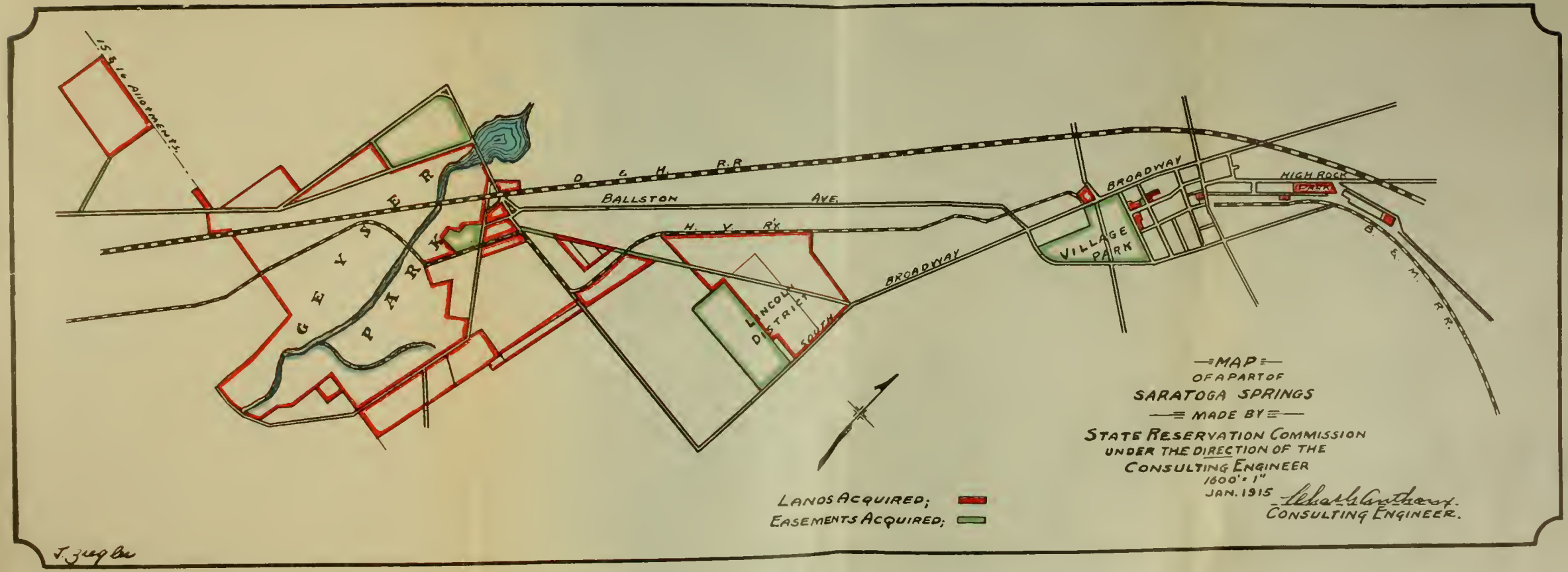
RECEIPTS TO DECEMBER 31, 1915

Jan.	7.	Wm. H. Manning, wooden pipe	$32 34
	15.	Trustees of Union College, 800 lbs. scrap iron pumps	2 00
April	13.	Wm. A. Heaslip, piece of second-hand railing from Congress Spring	2 00
	20.	J. Chauvim, 120-ft. used Georgia Pine	3 00
	21.	G. Butterfield, 2 second-hand window frames	1 00
	27.	Mrs. Ransom Qua, 365 pieces second-hand tile	14 60
	30.	J. Minnehan, second-hand bath tub	4 00
		Wm. P. Tarrant, 2 second hand bath tubs	10 00
		J. Lenehan, old wood from Congress Spring	50
		J. Heaslip, 2 old iron tanks from Congress Spring	3 00
		A. Lavine, scrap iron	2 00
		C. Colopietro, old wood	1 00
		J. P. Fitzgerald, old wood	2 00
		G. Butterfield, old wood	70
June	1.	A. Lavine, 2 scrap iron stoves	2 00
		Kayaderosseras Baths, bath and massage receipts, May	62 50
		High Rock Baths, bath and massage receipts, May	14 75
		E. C. Eaton, 31 second-hand bath tubs	186 00
	2.	F. W. Brownell, second-hand bath tub	2 50
		F. W. Brownell, 3 rolls barbed wire	3 00
	18.	M. D. Bradley, Shonts barn and dwelling wrecked	80 00
		C. Pedersen, second-hand bath tub	5 00
		M. D. Bradley, second-hand bath tub	2 50
	29.	High Rock Bath House, bath and massage receipts, June 1–29	303 25
July	2.	F. H. Partridge, commission on sale of sanitary drinking cups	4 87
	3.	Robson & Adec, commission on sale of sanitary drinking cups	34 39
	9.	G. Anibal, sale of spring water	10
	10.	Herbert Hall, sale of spring water	05
		R. Waring, sale of spring water	10
	12.	G. Anibal, sale of spring water	25
	13.	Delaware & Hudson R. R., damage to bath tub	20 00
		R. Waring, sale of spring water	15
	15.	R. Waring, sale of spring water	10
	19.	E. C. Eaton, Emperor Spring Building wrecked	8 00
	20.	R. Waring, sale of spring water	25
	22.	G. Anibal, sale of spring water	25
	24.	R. Waring, sale of spring water	25
	29.	J. Christopher, sale of spring water	90
	30.	G. Anibal, sale of spring water	20
		R. Patten, sale of spring water	30

1915			
July	31.	High Rock Baths, bath and massage receipts, June 30 to July 31	$1,047 25
		Lincoln Baths, bath, massage and swimming pool receipts, July 3–31	2,045 58
		Charles W. Hill, receipts from Geyser coffee room, July 12–31	32 10
Aug.	1.	G. Anibal, sale of spring water	25
		R. Waring, sale of spring water	05
		F. H. Partridge, commission on sale of sanitary drinking cups	10 66
	8.	Robson & Adee, commission on sale of sanitary drinking cups	84 82
	10.	R. Waring, sale of spring water	15
	12.	G. Anibal, sale of spring water	05
	23.	Kaufman & Pletman, old junk at Kayaderosseras Bath House	37 50
		F. W. Brownell, Cook dwelling and Coesa building wrecked	150 00
		G. Anibal, sale of spring water	10
		R. Waring, sale of spring water	10
		Kayaderosseras Bath house, sale of old wood	4 50
	31.	High Rock Bath house, bath and massage receipts, August 1–15	753 50
		Kayaderosseras Bath house, bath, massage and swimming pool receipts, August 5–15	376 90
		Lincoln Baths, bath, massage and swimming pool receipts, August 1–31	3,083 90
		Chas. W. Hill, receipts from Geyser coffee room, August 1–31	62 93
Sept.	4.	F. H. Partridge, commission on sale of sanitary drinking cups	8 49
		Robson & Adee, commission on sale of sanitary drinking cups	123 26
	16.	John Fahy, store rent, August	8 00
		Irving Coon, sale of box	25
	21.	Sherin & Son, store rent, August	12 50
	30.	Sherin & Son, store rent, September	12 50
		A. J. Getman, store rent, August and September	30 00
		Charles W. Hill, receipts from Geyser coffee room, September 1–16	25 85
		Lincoln Baths, bath, massage and swimming pool receipts, September 1–16	586 00
Oct.	1.	F. H. Partridge, commission on sale of sanitary drinking cups	2 08
		H. Hall, sale of spring water	05
	11.	Mrs. L. W. Noland, Groceries from Geyser coffee room	1 00
		John Fahy, store rent, September	8 00
	20.	A. J. Getman, store rent, October	15 00
Nov.	4.	E. W. Kemp, old windmill on Lincoln property	10 00

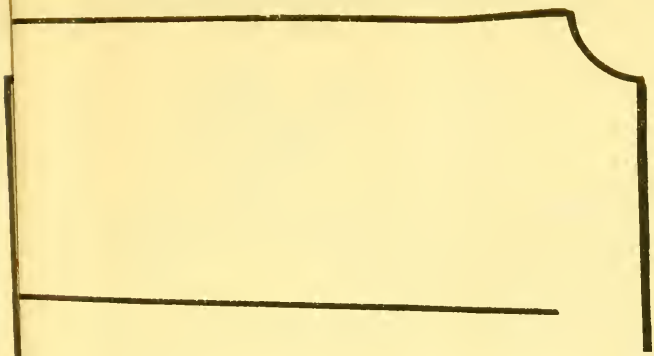
1915		
Nov. 5.	Robson & Adee, commission on sale of sanitary drinking cups	$53 96
10.	Hathorn & Co., commission's percentage of profit due on bottled water sales from the fiscal year, ending September 30, 1915	3,751 19
11.	John Fahy, store rent, October	8 00
20.	General Carbonic Co., compressed carbonic gas for September and October	737 10
	F. H. Partridge, commission on sale of sanitary drinking cups	90
29.	F. H. Partridge, commission on sale of sanitary drinking cups	92
Dec. 3.	Delaware & Hudson R. R., damage to Cararra glass.	44 84
10.	John Fahy, store rent, November	8 00
16.	The Travelers' Insurance Co., refund on canceled insurance	22 17
	Standard Oil Co. of New York, refund on empty oil barrels	7 34
	Delaware & Hudson Co., refund on freight shipment to San Francisco	3 76
18.	A. J. Getman, store rent, November	15 00
22.	General Carbonic Co., compressed gas from May 19 to September 1, 1915	532 92
	General Carbonic Co., compressed gas for the month of November	337 00
28.	Sherin & Son, store rent, October	12 50
	Sherin & Son, store rent, November	12 50
		$14,891 22

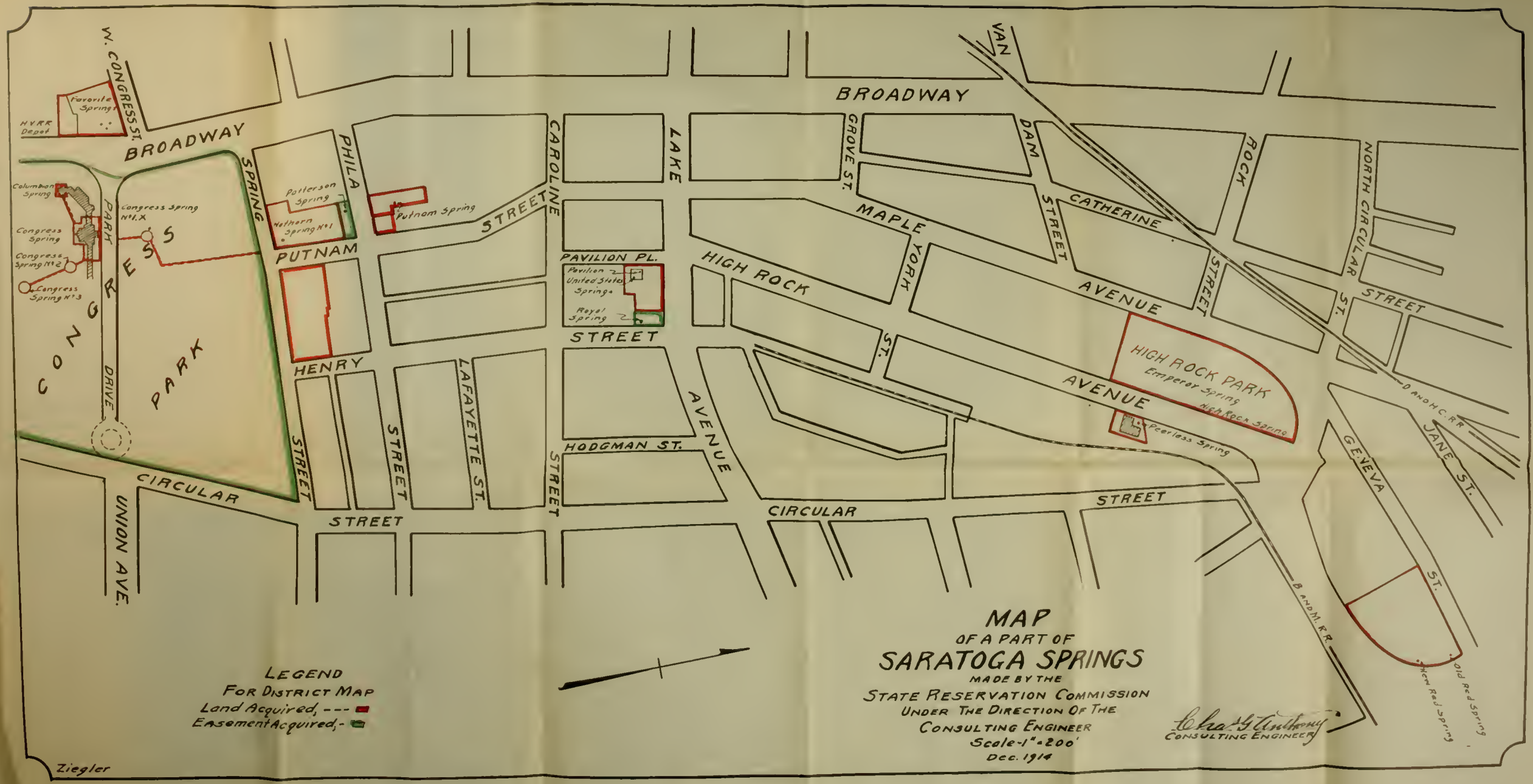
1915 REMITTANCES TO COMPTROLLER	
January 29	$32 34
March 29	2 00
May 29	43 80
July 7	661 50
August 7	3,195 09
September 11	4,565 41
October 2	806 85
November 9	26 13
November 30	4,562 07
December 31	996 03
	$14,891 22



MAP
OF A PART OF
SARATOGA SPRINGS
MADE BY
STATE RESERVATION COMMISSION
UNDER THE DIRECTION OF THE
CONSULTING ENGINEER
1600' = 1"
JAN. 1915
Elbert L. Carthaus
CONSULTING ENGINEER.

T. Zweg Del





LEGEND
FOR DISTRICT MAP
Land Acquired, ---
Easement Acquired, -

MAP
OF A PART OF
SARATOGA SPRINGS
MADE BY THE
STATE RESERVATION COMMISSION
UNDER THE DIRECTION OF THE
CONSULTING ENGINEER
Scale-1"=200'
Dec. 1914

Chas. G. Anthony
CONSULTING ENGINEER

Ziegler

BROADWAY
CHURCH
PARK

BROADWAY

MAP
OF
GEYSER
AND
LINCOLN PARKS
WITH
PINE PROMENADES
CONNECTING
MADE BY THE
STATE RESERVATION COMMISSION
UNDER THE DIRECTION OF THE
CONSULTING ENGINEER
SCALE 400 FT TO AN INCH
JANUARY 1910
CONSULTING ENGINEER
GEYSER LAKE
STATE NURSERY
BALLSTON
LEGEND

A Portion of the Spencer Trask Memorial.

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